FEB 18 1924

Vol. 22. No. 2 FEBRUARY, 1924

THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

Entered as second class matter February 10, 1903, at the post office at New York under the Act of 1879.

A MONTHLY PUBLICATION RELATING TO THE METAL AND PLATING TRADES

SUBSCRIPTION PRICE PER YEAR, UNITED STATES AND CANADA, ONE DOLLAR; OTHER COUNTRIES, TWO DOLLARS. THE METAL INDUSTRY PUBLISHING COMPANY, 99 JOHN STREET, NEW YORK, U. S. A.

Bronze Coating-N P

The original *one-coat* medium for applying bronze powders.

Requires no priming or other special preparation to insure a durable, tenacious, and flexible finish.

Produces a smooth plated effect—at a great saving, and with better results for certain work.

We will gladly prove these claims with convincing tests.

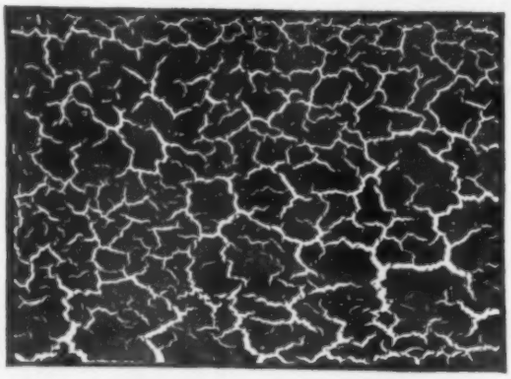
Waukegan Chemical Company

"Values that endure"

Waukegan - - - Illinois

Contents Page 71

Lacquering — *an art that was never lost*



Egyptian Crackle Enamel

Used over any of the Standard Egyptian Enamels, Egyptian Crackle Enamel will produce the result shown in the above actual photograph giving a finish similar to alligator grained leather. The sample plate from which this cut was made is finished with Standard Egyptian White Enamel over which has been applied a coat of Egyptian Black Crackle Enamel. The same artistic effect can be gained with other combinations of colors, among the most pleasing being Black on Old Gold, Blue on Emerald Green, Maroon on Gold, as well as a host of other equally attractive finishes. With proper application, the size of the crystals can be regulated, making the use of Egyptian Crackle Enamel adaptable for almost any requirement.

Made in Black and White and all Standard Colors

The Egyptian Lacquer Manufacturing Co.

5 East 40th Street, New York

Chicago Los Angeles San Francisco

THE
METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

VOL. 22 NEW YORK, FEBRUARY, 1924 No. 2

The Metal Trades and the Radio Industry

Opportunities Which Metal Manufacturers Have Not Yet Grasped

Written for The Metal Industry by RAYMOND FRANCIS YATES

Has the metal trade had its share of business from the radio industry? A proper answer to this question might show those interested in metal parts that there is still plenty of opportunity to enter this still infant industry. Perhaps many have given the matter consideration and thought only to conclude that radio is too closely allied to the electrical industry to warrant the effort that might be involved in entering it. True, a radio receiver is essentially an electrical device, but unlike most electrical instruments, it is made up of a large number of independent devices that differ greatly in construction. The opportunities for improvement in construction features and for the use of metal materials is alluring to say the least.

IS RADIO BUSINESS PERMANENT?

There is still another consideration that may have prevented the entrance of many metal manufacturers. Is the radio business here to stay? Will it be a normal, healthy business that can be depended upon? Of course, the great radio slump of 1922 is no secret. It brought with it ruin and destruction and it was due to nothing more or less than very serious overproduction. Every Tom, Dick and Harry who owned a lathe or a drill press, set it up in the garage or cellar and went into the radio business. Consequently, the whole industry suffered and when the summer of 1922 came, great confusion resulted. Although the public was buying radio apparatus as fast as it will ever buy it in the summer time, the amount of apparatus available and the large number of retailers to handle it, made it an apparently dead season. However, this set back, or apparent setback, did a great deal of good to radio for it not only weeded out a lot of the undesirable dealers and jobbers but many of the half-rate manufacturers as well who left the work they were doing to be picked up by more capable producers.

During this slump, many of the "I-Told-You-Soes" maintained that radio was done—that it had "coughed up the ghost." It was, to them, the mere passing of a fad, just as their fathers had said the automobile and phonograph would pass. But radio is still here because it has a place to fill in the scheme of things. It has proven itself to be a great industry. Over three million receiving sets have come into use during the past three years. What industry can parallel that record?

The writer mentions the foregoing simply for the purpose of trying to convince those who have been doubtful about the future of radio, that there is no need for fear. A great and new industry is rapidly coming into its own; an industry that will soon take its place next to the moving pictures.

PLACES FOR METALS IN RADIO APPARATUS

What can I do? What can I make? These are questions that those who desire to get into the radio business might ask. Before answering it, the writer wishes to give a few words of warning. Whatever is made should be well made and should be designed by a man thoroughly competent. Since radio operates on very delicate principles, details count. What may be pleasing to the eye may function very poorly when exposed to the action of the high frequency currents in a radio receiver.

CABINETS

What is there in radio that lends itself to production in metal? Let us take the cabinet to start with. The woodworking manufacturers immediately got busy when radio started and made up standard cabinets which were not only sold retail in the many radio shops throughout the country but to manufacturers of complete sets as well. Indeed a very thriving business was established. There is no advantage in using wood for a radio cabinet and the writer feels sure that any manufacturer of pressed brass or aluminum (pressed iron or steel, owing to magnetic properties cannot be used) parts should have entered this branch of the field with the assurance of a goodly portion of the business if he would have taken the pains to give the material a pleasing finish. That this idea is sound from the standpoint of electrical efficiency is proven by the fact two of the largest and most powerful producers of radio apparatus with vast and competent research forces at their disposal, adopted the same idea.

Although no really accurate figures are at present available, it is estimated that no less than two million radio sets have been fabricated by laymen within the last three years. This means that at least one million cabinets have been sold.

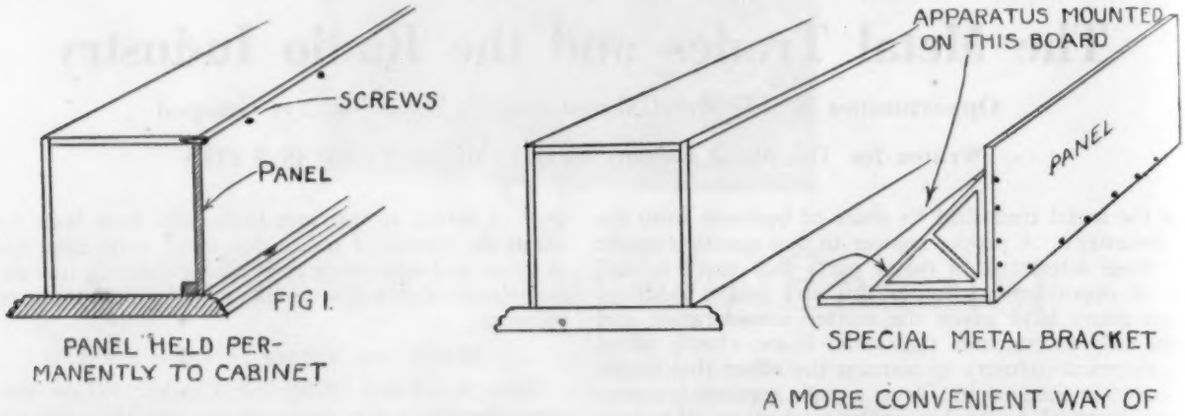
DIALS AND KNOBS

Take the matter of dials and knobs. These have been produced in Bakelite, Formica and various other insulating

compounds including the rankest kind of colored shellac which contains great amounts of carbon. Here again is a need that the pressed non-ferrous metal manufacturers could very easily fill. There have been a few pressed brass dials on the market, but the market in general has been entirely dominated by the molded product. There is no advantage in using material of this kind for this purpose. In fact, metal dials could be designed that would possess many mechanical advantages over the molded article. Then, too, they could be given finishes that would match beautifully with any of the panel materials now on the market.

SOCKETS

What holds true concerning dials, holds true concerning sockets as well. As far as the writer's knowledge goes, the pressed steel vacuum tube socket has yet to make its appearance, yet its production comes easily within the range of work possible in the average pressed metal plant.



REPLACING SCREWS WITH BRACKETS IN A RADIO CABINET

Of course, the matter of proper electrical insulation enters into the question, but this is something that could be settled with a few minutes of consultation with a radio engineer. Most of the sockets on the market today are of the molded type. A few have been made with metal collars and Bakelite bases.

VARIABLE CONDENSERS

The variable condenser field is still another branch of radio that has been left wide open for the pressed metal manufacturers. Here is a job that, aside from assembling, is practically completed on the punch press. It has been said that over eight million variable condensers have been sold since the radio rush began. When it is said that two and sometimes three and four variable condensers go into each radio set, some idea of the number that will be used in the next few years will be had. Here again, the matter of proper insulation must be considered, but there will be no great obstacles to overcome.

LOUD SPEAKERS

Loud speakers are also among the devices that practically any well-equipped metal manufacturer could easily produce. Most of these devices are simply horns arranged to take a standard talking unit. To the writer's knowledge, only three metal manufacturers have gone into this angle of the business. Yet the loud-speaker business will be enormous for a number of years to come. When radio was first introduced, most of the users employed 'phones for reproduction. In the future, however, the loud-speaker will practically rule and those who are close to the radio industry believe that over two million loud-speakers will be sold yearly for the next five years.

MISCELLANEOUS PARTS

There are many little things on a radio set that could be manufactured with the equipment found in the average metal stamping factory. The telephone jack is one of these. With the exception of a few stamped pieces of insulation all of the rest of the parts are of pressed or stamped brass. Since the insulation is cut from sheet stock with a regulation die on a regulation press, nothing special is needed in the way of equipment.

In fabricating a radio receiver, one must fasten the base of the cabinet to the panel on the front. This is usually done with screws as illustrated in the sketch. How much more practical it would be to use a couple of special brackets as illustrated! Here is a little item that serves to illustrate the possibilities that exist in the field. There are a dozen and one little things that could be produced like this and which would find a ready sale with very little introductory advertising.

The writer could carry this article on many more pages, but he hopes that what he has said will awaken the pressed metal producers to the opportunities that are before them in the great field of radio communication.

Cutting Tools

Q.—What shape of cutting tool is best for manganese bronze? Cast aluminum?

A.—If the job of manganese bronze must be turned between centers, the best cutting tool is a rigid single diamond point, with plenty of rake and clearance. If the work is to be machined in a Monitor lathe, the same applies to any tools used in the cross slide, used for facing or undercutting; while the tools used in the turret head, such as mills, taps or dies are usually given an extra clearance. If self-openings dies or collapsible taps are used, the chasers are slightly lipped. High-speed steel can be used to advantage if the castings are clean. Ordinary cooling lubricant (soluble oil) can be used to advantage, but should be richer in mixture than that used upon composition brass. If carbon steel is used, care must be taken in the tempering of it to obtain the maximum of hardness, without chipping. These tool conditions are almost identical with those for aluminum castings with the exception of the lubricant employed, for which kerosene oil is substituted. Some factories use a mixture of one part turpentine to three or four parts kerosene, but kerosene alone gives excellent results.—W. F. Hirschmann.

New Uses for Metals

Conclusion of a Symposium on the New Uses for Metals Developed During the Past Few Years*

MISCELLANEOUS METALS

By Adolph Bregman
Managing Editor, The Metal Industry

SILVER

The silver industry is concerned with a situation quite different from that of the other metals. Up to a short time ago producers had been helped by the Pittman Act which authorized the Government to buy the metal at $1.00 a pound. In order to replace metal sold to foreign governments at that price during the war, a limit was placed on the amount of silver to be bought, about 200,000,000 ounces. After this purchase had been completed, the domestic price of silver dropped back to the general level of foreign silver.

In addition, of course, the industry had to find ways and means to dispose of the quantities which had gone into the Mint. As a result, considerable agitation ensued for spreading the uses of silver, resulting in an investigation by the Bureau of Mines into possible new uses and an appropriation for further research along these lines.

Aside from this activity, however, the feeling of those engaged in the manufacturing of silver is that better results will be gained by pushing the known uses than by attempting to work up new ones. At the present time there are sufficient outlets for silver to absorb the production without difficulty, provided that they receive proper support. The silver industries are carrying on a campaign of education to increase the use of this ware. Silver-plated automobile trimmings and hardware are beginning to be used, as are also silver contact points for electrical purposes. The large chemical uses of silver, such as nitrate, chloride, bromide, cyanide, etc., and other compounds for uses in photography, plating, etc., remain standard, with no prospect of decline.

MAGNESIUM

This is a comparatively new metal, at least so far as the commercial exploitation of the metallic material is concerned. Magnesium in ribbon and powder form has been used for many years in pyrotechnics, but the use of the metal began only during the war period when a shortage of copper and aluminum in Germany stimulated its production as a substitute for these metals. There were developed series of magnesium-aluminum-zinc alloys known as Elektron, which has since been introduced into the United States, and together with American magnesuim, has brought about the recognition of its possibilities as a light-weight structural material.

Its uses at the present time are largely in the realm of the possible, as far as the United States are concerned, at any rate, but they cover a wide field. According to statements of both the American and foreign producers, magnesium will be found valuable because of its light-weight and comparatively high strength in structural shapes, reciprocating parts of engines, airplane parts, internal combustion engine parts, such as pistons, connecting rods, housings, etc., screw parts, shuttles and bobbins for textile machinery, etc. (A fairly complete list of its uses will be found in the article on Elektron Metal in The Metal Industry for January 1922, page 1). It is stated, moreover, that large quantities of magnesium in the form of Elektron metal are in actual use abroad in pistons for automobile and airplane engines, and the electrical industries.

* Part 1 was published in our January issue.

PLATINUM

Platinum is not an American product except insofar as its fabrication and manufacture are concerned. Some platinum has been found in a few places, but subsequent investigation seems to have shown that quantities were negligible and would not pay to work. A short time ago the Bureau of Mines published a warning to the public to look carefully at offers of stock in platinum producing companies in the United States, stating that this country had produced only a few hundred ounces of platinum per year, but that certain promoters backed by erroneous assays had made very fanciful announcements concerning properties claimed to contain platinum in commercial quantities.†

Originally (and basically) the real use for platinum was as a scientific and industrial material for such purposes as platinum black, platinum sponge, platinum salts, platinum apparatus for laboratory ware, lead-in wires for incandescent electric bulbs, Thermo-couples, hypodermic needles, and as a catalyst. In recent years, however, the use of platinum in jewelry has grown to such an extent as to inconvenience, seriously, industrial users. Probably because of its high cost it has become fashionable, although its adaptability and beauty under most conditions in which it is used is a matter of considerable argument. How long this condition will last is difficult to state.

ANTIMONY

There have been no changes in the status of antimony as an industrial material. It is still a standard constituent of low melting white metal alloys, such as type metal, Britannia metal and stereo metal.

MERCURY

Aside from its regular uses and their customary growth, mercury has made no unusual advances until almost within the last few days. It has been stated by the General Electric Company that a boiler producing vaporized mercury for use with a mercury turbine has given unusual results in the production of power. This development is still more or less experimental, however, and although it promises a very interesting advance it has not yet arrived at the proved commercial state.

†The Metal Industry, September, 1923, page 368.

Power-Show

The second National Exhibition of Power and Chemical Engineering was held at Grand Central Palace, December 3 to 8, 1923. Among the exhibitors were the following firms, interested in metals.

American Brass Company, Waterbury, Conn.
Fabricated metal products.

Bridgeport Brass Company, Bridgeport, Conn.
Fabricated metal products.

Chase Companies, Waterbury, Conn.
Fabricated metal products.

Metallo Gasket Company, New York.
Bead gaskets and packing metal.

National Engineering Company, Chicago, Ill.
Foundry equipment.

S. Obermayer Company, Chicago, Ill.
Foundry supplies, refractories, etc.

Scovill Manufacturing Company, Waterbury, Conn.
Fabricated metal products.

The Molding Machine

Early History and Development. Simple Forms of Foundry Machines.

Written for The Metal Industry by R. E. SEARCH, Exchange-Research Editor

Molding by hand is an art so ancient that no modern historian has even ventured to chronicle its first appearance in the annals of civilization. The first attempt at molding by hand for commercial purposes was probably executed just as it is today. The first vibrator employed by man was a pointed wire driven into his pattern, through the cope of his mold, let us say, and rapped back and forth by a bar of some kind to loosen the pattern in the sand, so that when the cope was rolled over the pattern could readily be withdrawn.

THE FIRST PATTERN PLATE

Among the appliances used which have helped to make the modern molding machine the instrument of precision that it is, the pattern plate must be considered as its most valuable acquisition. The earliest reference the writer has been able to find about such a plate, which happens to be a faithful replica of the modern match plate, occurs in Beitrage zur Geschichte der Technik und Industrie of 1910, volume 2, page 100. It is said that the first founder to make use of this appliance was manager Frankenfeld of the "Rothe Hütte" in the Harz, Germany; he used them for making molds for some parts of their lower furnace, which, at times, had to be furnished in large numbers to the Rothe Ironworks. Figure 1 shows a reproduction of the plan and section of the Frankenfeld pattern plate, first used in 1827. The following explanation is given of the plate: the pattern is attached to the pattern plate, the latter is provided with an inlet gate, *a*. The pin of the flask to set in the hole, *b*, of the plate and thus ensure the reverse position in the compression of the sand. The second pattern plate upon which the other flask was set, was provided with a thick edge, in which a notch of the flask exactly corresponded with it, since it possessed no pins but holes to ensure the position of the cope. The point indicates a projecting piece *c*, which is attached by pins to the pattern stuck fast in the sand, from which it is subsequently withdrawn in the usual manner.

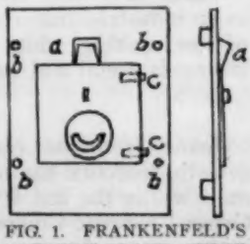


FIG. 1. FRANKENFELD'S PATTERN PLATE, "ROTE IRONWORKE," 1827.

THE FIRST PATENTED MOLDING MACHINE

It was stated by Wilfred Lewis in his able article on Machine Molding published in the Journal of the Franklin Institute, vol. 172, 1911, p. 230, that in 1800, an English patent was granted for molding screws, the patterns for which were backed out of the sand by lead screws of the same pitch. The statement made by Lewis, although not mentioning the name of the inventor, and also indefinite as to the exact date, is confirmed by some illustrations shown in the Beiträge (previously mentioned) of various shapes of flasks, dated 1802; some of them so similar in shape, pin and socket construction to what we are using today as to be almost incredible.

The machine mentioned by Lewis was simply a pattern drawing machine of rather ingenious construction, but the English records do not mention another molding machine until 1839, when a similar patent was announced. From this time forward more interest seems to have been taken and these patents were soon followed by others for ramming sand by mechanical means, including hydraulic cylinders, stampers and rollers of the road-roller type. Machines for molding gears and pipes also appear in the first half of the 19th century, and in 1843 we find an American patent on the molding of cannon balls.

In the Beiträge, of 1910, page 114, U. Lohse gives the credit to Charles Bergue of France for inventing the first molding machine which drew the pattern accurately from the sand. This machine was exhibited at the Paris Industrial Exposition, in 1855.

According to U. Lohse, in the Beiträge, page 125, a view is given of the first molding machine upon which a pattern plate was used, by its owner, in Hamberg, in 1867, and reproduced in Figure 2. Later in 1869, the first jarring machine patent was taken out (probably by Harris Tabor, of Philadelphia). In the same Beiträge, p. 142, U. Lohse states that Harris Tabor produced a steam-driven, draw-through molding machine, which during the course of the first year's experiments, underwent a series of interesting developments. Steam as a source of power was abandoned as unsuitable and was soon successfully replaced by air-pressure.

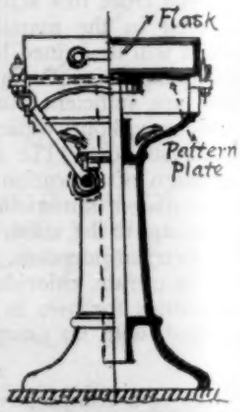


FIG. 2. LOHSE PATENT MOLDING MACHINE, 1867.

THE VIBRATOR

In producing a mold at his bench the modern molder makes use of a little device so familiar to every bench and machine molder, it is known simply as a vibrator, "with a kick to it." For ordinary light castings where the molds are made on a bench the vibrator is attached to the flask or to the pattern in such a way as to jar the pattern loose from the sand without any appreciable displacement of the sand. Some of the vibrators now in use consist of a double acting elongated piston having a stroke of about 5/16-inch in a valveless cylinder, and impacting upon hardened anvils at either end at the estimated velocity of 5,000 blows per minute. To impart these vibrations to the patterns and yet keep these small oscillations from being taken up by the rest of the mechanism is the function of the vibrator frame.

THE VIBRATOR FRAME

To suspend a pattern properly in a vibrator frame, a carrier of sheet brass (⅛-inch thick has been found most suitable), is fastened to the pattern or gate of patterns. The way in which this carrier is fastened must depend upon conditions, soldering or sweating, however, being most common. It is now generally agreed that sweating is the most durable method.

In putting a carrier on a gate of patterns, it is desirable if possible, to attach the carrier to the runner, as this will eliminate some grinding of the castings, and if the patterns are light, will allow a slight spring of the patterns in the match when ramming the drag, thus preventing the springing of the pattern when the cope is rammed on the drag.

The next operation is to locate carriers in the slot of the vibrator frame to meet those fastened on the patterns.

These carriers should be rigidly fastened, but easily removable. To do this, after the carrier has been pushed into the slot in the vibrator frame, two 3/16-inch holes are drilled through both frame and carrier, and a brass pin is snugly driven into each, but not riveted over. Holes are now drilled in the carriers on the pattern, and the pattern is put on the vibrator frame, all carriers meeting, and the place to drill the carriers in the frame is marked with a scribe from the holes already drilled in the carriers on the patterns.

This method has been found to be much quicker than clamping the carriers together and drilling through both at once, and at the same time it is sufficiently accurate for the purpose. The slot in the vibrator frame should be filled with wax to prevent the crumbling of the mold at the edges.

Figure 3 (by the courtesy of the Tabor Manufacturing Company, of Philadelphia, Pa.), shows a gate of patterns fitted in a vibrator frame as above described.

THE ART OF MOLDING

It is well known that the art of molding began in a small way on bench work and continued chiefly in being restricted to small molds that could be handled by one or two persons until the end of the 19th century. Larger work was considered as inapplicable to machine molding, or at least impracticable until the jarring machine made its appearance. This machine met with a prolonged and bitter opposition and silly prejudice before its great merits were fully understood and its peculiar fitness for ramming large bodies of sand was demonstrated. Even today its great utility is questioned by its foreign competitors who find it impossible to design squeezer machine operating on the slowly accelerated pressure principle to take its place or do its splendid work.

FIG. 3. HOW PATTERNS ARE MOUNTED ON A VIBRATOR FRAME

VIBRATOR COKE BENCH FOR THE MAKING OF CORES

No less important adjunct to machine molding than the flask itself, is the almost insignificent little device, already alluded to as the vibrator, is the vibrator core bench. By its use it is no longer necessary to shatter a core-box to pieces by pounding its frame-work into kindling wood. The little vibrator, "The vibrator with the Kick" as it is humorously termed by the core-girls who use it, and adopted as a slogan by the Malleable Iron Fittings Company of Branford, Conn., in connection with the new Branford core bench. It is described as the miniature of its elder brother the modern molding machine. Figure 4 gives a view of this core bench with an inset of a tiny vibrator that has kicked its way into the good will of every foundryman that has tried to use it.

FIG. 4. BRANFORD VIBRATOR CORE BENCH AND VIBRATOR

HAND OPERATED MACHINES

There are some foundries where compressed air as a tool has not yet been tried or installed, either through lack of capital, or on account of ingrained ignorance, or by some insurmountable wall of prejudice. In all such cases competition is the tooth of time that may eat its way through all obstructions. There are, however, a few machines which will serve in the foundry not large enough to afford a compressed air installation.

Figure 5 shows a molding machine, known in the trade by the odd number of 611. It is made by the American Foundry Equipment Company of 368 Madison Avenue, New York City. Its makers claim that the common sources of loss in pneumatic systems is 10 per cent on the motor, 15 per cent on the belt, where belt drive is used, 20 per cent on the compressor, an indefinite large loss on the air receiver or tank, 10 per cent on the air line, with the valves sometimes too large, with a large, undeterminate loss by freezing of the air cylinders on the machine, and in this mannner (where the compressor is improperly designed or installed), one often loses more

than three-quarters of the power paid for to run the motor. In plain English the total efficiency does not exceed 25 per cent.

FIG. 5. A HAND OPERATED MOLDING MACHINE No. 611. AMERICAN FOUNDRY EQUIPMENT COMPANY.

It is claimed for the No. 611 molding machine that it will jolt, squeeze, roll over and draw without air. The operator, himself, furnishes all the motive power used unless he avails himself of an electric vibrator (connected to an ordinary lamp socket) which consumes no more power than an electric light. Even here the tiny midget, the vibrator, cannot consistently be ignored. Any man with a good flexible muscle can soon make molds with a machine like this; it is claimed that the various operations are easy to perform and at the end of the day the machine operator will be as fresh as the bench operator even though he has made five times as many molds.

Figures 6, 7 and 8 show a little machine that is used for producing small and medium size castings. They are operated without the aid of compressed air. All the working parts are above the table, hence sand cannot get into the machine. The stationary machine, Fig. 6, requires but 25 square inches of floor space; the smaller type of portable machine is shown in Fig. 7. The swinging arm is balanced in a hardened steel center. It thus making it convenient for bench molding as well as for squeezer work. The parts are made of steel, malleable iron and semi-steel castings and are capable of long and economical service. Fig. 8 shows a more elaborate machine, so arranged as to straddle the sand heap. It has an additional receptacle for the odd side where bench molding is in progress. These machines can use flasks as large as 12" by 24". For these little machines it is claimed that as many as 285 molds (10" by 16" flasks) have been put up in 7½ hours.

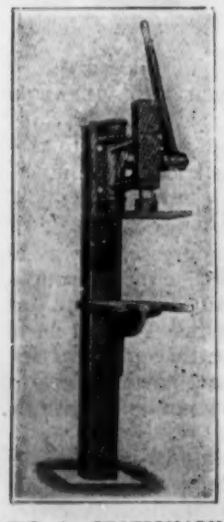


FIG. 6. STATIONARY HAND MACHINE FOR SMALL WORK

One of the latest hand-operated squeezers is the machine shown in Fig. 9. It is known to the foundry trade as the Victor Hand Squeezer, with electrical attachments. It is made and vouched for by the Chicago Molding Machine Company of 2028 North Major Avenue, Illinois. It is a portable contrivance and can be worked alongside of a sand heap. It is 42-inch between wheels. It has a Victor Electric sand riddle attached as shown. This device is so useful and so labor saving it is strange that such a device has not become a universal attachment to every hand-operated molding machine. The squeezer head can easily be swung over the flask and adjustment can be quickly made to various heights. The flask table can be quickly raised or lowered, it is held in place by two loose pins. Equipped with large and wide - faced wheels, it permits the operator to move the machine with ease. The adjustable rack located at the right of the operator is convenient for holding a plaster match or a box of cores. The electric sand riddle is mounted on a bracket and can be raised or lowered at will. Also the riddle is detachable so that it can be carried and used anywhere about the foundry. It is operated by 1/6th H.P. The electric vibrator can be used bolted beneath the table for a match-plate job or removed and attached to a match-plate.

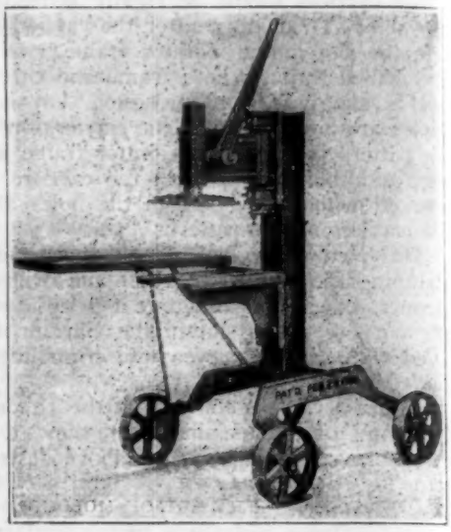


FIG. 7. SMALL PORTABLE MACHINE.

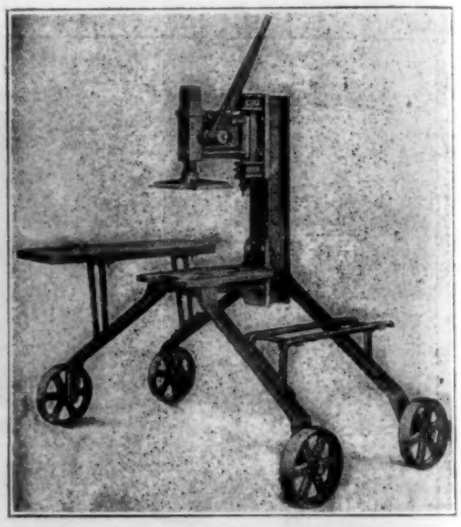


FIG. 8. PORTABLE MACHINE TO STRADDLE SAND HEAP.

FIG. 9. VICTOR HAND SQUEEZER, WITH ELECTRICAL ATTACHMENTS.

Graphites for Brass Melting Crucibles

A Discussion of the Report from the Bureau of Mines Recommending American Graphites. Based on an Interview with JONATHAN BARTLEY, Graphite Expert

In THE METAL INDUSTRY for December, 1923, was published a paper on Graphites for Brass Melting Crucibles by R. T. Stull and L. E. Geyer. This article was reprinted from a report of investigations by the Bureau of Mines, Serial No. 2542, published in November, 1923.

According to the experiments carried on by the authors, graphites from various parts of the United States and abroad were tested in competition with each other. After being made in the usual manner (at the plant of the Vesuvius Crucible Company, Swissvale, Pa.) the crucibles were taken by the Detroit Lubricator Company, Detroit, Mich., placed in a dryer and kept at a temperature as near to 220° F. as possible for a period of one month. The crucibles were also tested against two brands of commercial crucibles, one of which was formerly used at that plant, the other being a product of a well known manufacturer. The compositions of the alloys used in these tests were as follows:

	A	B
Copper	78	84
Tin	3	4
Lead	7	4
Zinc	12	8

The tests were completed and the following table shown on page 478 of THE METAL INDUSTRY for December, 1923, was the result.

GRAPHITE	AV. NO. OF HEATS	AV. NO. MINUTES PER HEAT
A (Alabama)	13.1	102.6
R (Madagascar)	12.4	96.1
C (Ceylon)	10.5	102.1
N (New York)	9.6	101.9
T (Texas)	6.8	97.7
M (Montana)	6.1	99.3
K (Canadian)	5.8	102.0
X (Commercial)	12.8	103.3
Y (Commercial)	11.9	95.1

The conclusions drawn from these results were set forth in the summary as follows:

"From the data set forth in Table 2, it will be noted that Alabama graphite bonded with the American clays gave superior service, a service at least equal to the commercial crucibles of the same class which have been sold on the open market. Ceylon graphite which is considered by many manufacturers to be best for crucible work, was third in the list of tests and Canadian graphite which had been recommended very highly because of its structure, was last in the list.

"While not sufficient number of crucibles was tested from which to draw definite conclusions, it is evident as far as the work has been carried, that American bond clays and Alabama graphite can be used to make a superior brass-melting crucible."

Since the publication of this paper, we have received a number of statements disagreeing sharply with these results. Two crucible manufacturers expressed their opinions (published in THE METAL INDUSTRY for January, 1924, page 26), both stating that American flake graphite could not be used to advantage. Therefore, in view of these decided statements in the face of experiments carried out by the Bureau of Mines, we investigated further in order to explain the wide divergence of opinion. Obviously, there was much to explain. The above table showing that Alabama graphite was superior to others used (these others including Madagascar and Ceylon graphite), showed the results obtained up to 13.1 heats per crucible. This at once points to some defect either in the manufacture of the crucible, in the handling, or in the general conditions surrounding the tests. Thirteen heats per crucible is a very low record, as any foundryman will agree. A crucible should give from 30 to 40 heats at least before it can be considered commercial. The fact that the commercial crucibles in the tests gave only from 11.9 to 12.8 heats per crucible showed that there was some unusual condition which must have existed at that time. What is the explanation?

Upon investigation it was found that the tests were carried on from 1918 until 1922. According to a communication from the Ceramic Experiment Station of the Bureau of Mines in Columbus, Ohio, at which the work was done, "The materials were assembled in the early part of 1918. Considerable trouble was experienced in getting the graphites which were not secured until the early part of the summer. The first crucibles were not ready for tests until December, 1918. After the Armistice no special effort was made to rush an investigation through and it was not until the fall of 1922 that the last of the crucibles were tested commercially." It seems then that the experiments stretched from the early part of 1918 to the latter part of 1922. What conditions existed at this time which would cause commercial crucibles to stand only 11 to 13 heats apiece?

From information furnished by those in close touch with the graphite and crucible industries, it seems that during, at least a part of this time, because of conditions brought on by the war, it was absolutely impossible to obtain good Ceylon or Madagascar graphite. The only material obtainable was of a grade which would be refused now. According to statements by prominent crucible manufacturers, good crucibles could not be made out of the material available. As a result the Alabama graphite was tested against very low grade Ceylon and Madagascar graphites. Moreover, the Alabama graphite was the best obtainable from that source. Since then, no better results have been obtained from Alabama graphite. On the other hand, as every foundryman knows, any good crucible made of Ceylon graphite will run from 30 to 40 heats or more. Therefore, the tests published by the Bureau of Mines are hardly conclusive, because of the fact that the materials involved were not representative. This accounts for the continued opposition of the crucible manufacturers to the use of American graphites and their disagreement with the results given in the paper under discussion.

So far as bond clays are concerned we are advised that American clays can be used in some cases to excellent advantage. This, however, is a matter of individual preference and perhaps local conditions. According to the letters published in THE METAL INDUSTRY for January, 1924, page 26, the Ross-Tacony Crucible Company of Tacony, Pa., has found American clay unsatisfactory, while the Jonathan Bartley Crucible Company is using this material in its mixtures.

So much for this discussion, at least so far as the crucible manufacturers' point of view is concerned. We should like to hear from the Bureau of Mines giving their side of the question.

Correction

On page 12 of our January issue the caption under the illustration of the American Tripoli Company Drying Shed should have read "Total Capacity 6,000 to 7,000 tons," instead of "Annual Capacity."

Impressions of British Brass Foundries

British Efficiency (?) As Seen by An American Brass Foundryman and Jobbing Foundry Operator

Written for The Metal Industry by THOMAS HARPER, Brass Foundryman, New York

"Oh, wad some power the giftie gie us
To see oursel's as others see us." (Burns)

"A chiel's amang ye takin' notes
And faith he'll prent it." (Burns)

BRASS FOUNDRIES IN ENGLAND AND SCOTLAND

In the course of a vacation trip through Scotland and England, I visited a few jobbing brass foundries. Both in work and practice they are very much the same as the jobbing brass foundries in the United States. The lay-out of the various foundries varies as much as it does with us. The furnaces used are of the pit type (some foundries use gas, others use gas coke, while others use coal), and are generally located well out in the shop dividing the cleaning room from the molding room. They are usually built around a brick chimney, two or three furnaces on one side and two or three on the other, tending to give a well-balanced draft. The molding tubs are arranged around the walls to suit light conditions, leaving a clear floor space for pouring or to do larger work on the floor. As the weather is so much cooler in summer over there than here, this arrangement works out very well. In none of the shops that I visited were there any molding machines, as they were all jobbing shops and had no long runs of standard work. They are all acquainted with the modern types of molding machines but explained that their quantities do not admit of much gating or plated patterns. The patterns vary according to the locality and the nature of the manufacturing in the neighborhood. The sand used for brass foundries was of a reddish color about the same as Windsor Lock; much stronger or more clayey with the same feel and grit as Albany sand. Green sand oddsides were the only ones I saw used. They were very carefully made and parting edges well maintained, not rammed away. Flasks used for regular jobbing seemed to be of standard size, 10" x 12" x 4", (built higher where necessary), and of course, each foundry was equipped with larger flasks, to accommodate other sizes of work, which had been accumulated during years in business. But I did not see a wooden flask or a snap flask in any of the foundries visited. I was told that they used snap flasks on iron, in the Singer Sewing Machine Company foundry, outside of Glasgow.

WAGES AND A DAY'S WORK

A brass foundryman was asked how many molds were made per eight hours. "Of that size," indicating the 10 x 12, "we get from nine to twelve molds per day, according to the patterns."

"Isn't that a very small day's work? Why in the New York district using the standard flask, 12½" x 18" x 5", we get from sixteen to twenty-four molds per eight hour day from the same class of patterns that I see you using. That's three times the day's work you get."

"Yes, I know what you say is true and it isn't any 'Yankee blowing,' as the men would say it was. A molder who used to work as my foreman went to the United States about ten years ago, just before the war started. He came back about three years ago and he told me the same tale as you tell now. I have known him since he was a boy and he was always honest and truthful. He said my molders did not give me a quarter of a day's work on some jobs. He works in Brooklyn. He said he could not put up a day's work, at first, when he went over to the States, but now there is nothing to it."

"What wages do you pay?"

"The union rate is three pound, seven shillings and sixpence per week. That is the union rate all over the country though some men get a little more. The employers are asking for a reduction of wages on the ground that the wages are too high and we are losing all our foreign trade. The workingmen are demanding higher wages. They claim they have to get higher wages to enable them to live, and living costs are constantly going up."

I replied, "Your living costs must be as high as in the United States, for everything we have bought costs as much here as it would in New York or Brooklyn. In all the window shopping we have done the prices marked are all as high, some of them are higher than in New York. How much are rents?"

"Very high and rooms are very scarce. The rent for two rooms, the usual workingman's apartment, is twenty-five shillings per week. This price includes the 'rates' or 'taxes.'

"Using $4.50 as the rate of exchange for a pound and fifty-two weeks to a year this would amount to $12.00 per room per month, just as high as in Brooklyn, and where a skilled British workman is satisfied with two rooms, an American workman demands, and is able to pay for, from four to five living rooms, a kitchen and a bathroom; and millions of American workmen own their homes with still larger accommodations."

(I notice that a great many towns are adversely criticising the municipal authorities of Dundee because they had the audacity to make proposals for improved housing for workmen in which an apartment consists of two rooms and a **bath.**)

"The wages of three pound, seven shillings and sixpence at an exchange rate of $4.50 for a pound would amount to about $15.00 per week. The wages we pay molders as an average all over the United States are $45.00 per week and a great many of our molders are getting $1.00 per hour. At the average of $45.00 per week our men are getting three times the wages yours are getting in Scotland and England. Of course, when your men only put up nine to twelve molds per day on a 10" x 12" x 4" flask as an average, while the molders in New York and Brooklyn put up from sixteen to twenty-four molds per day on a 12½" x 18" x 5" flask your men are doing only one-third of the work and so they are being paid for all they do. They can easily do more. Why don't you pay them more and get them to do more instead of cutting their wages? This would give them better living conditions and would not put up the prices as doing less per day at the same wages would."

He answered: "The men will not do more per day. The tendency is to do less. They claim that there is not enough work to go around and there are too many men out of employment. They say that if they did more work they would only be doing an injury to their fellow-workmen by putting more men out of employment, thus putting more men on the dole, making a lot of loafers, men who won't work at all. The labor unions have the power here. The labor union leaders and soap box orators know the wages paid in the United States, in the various trades, and they know what castings are sold for there, and here, and that is at about the same price in both countries. They

claim that the British workingman is just as skilled as the American and call attention to the hundreds of thousands of Scotchmen and Englishmen who go over to the States and are able to earn the high wages and that the employers of Britain are making them work for low wages (not enough to live on) and therefore are making unjust profits. That, they say, under a Socialist or Labor Government, would not be allowed but they will never, under a Conservative, Unionist, or Liberal Government, **get justice.** They believe it themselves, and they have dinged that into the ears of the workers so long that everyone believes it is the full truth. I thought that employers made big profits until I went in business for myself thirty-five years ago and found I was able to make only a living, and when I had sunk my savings I could not get out. Today outside of my little foundry business I have really not one pound to rub against another. For years I have been wondering what was the matter with me and I never found out. Why, the high wages and better conditions in America are so well known that every able-bodied man or woman in Scotland would go there if he or she could. All our best and brightest young men are going. But I'm too old, now."

"Have those labor men ever told you that when Scotsmen and Englishmen go over to the United States, although they are rated as good molders over here, they cannot put up a day's work for the first six months or a year and have to knock about from one job to another until they get broken in?"

"No, they never mentioned that, but I see it now."

"And what is true of the brass molders' trade is true of every other trade when they come over to this side, **they have to increase their capacity to work."**

TAXES AND PRODUCTION

In the John O'Groat's House Hotel I noticed that the guests were from Canada, Australia, New Zealand, Buenos Aires, the United States, and London, England. In the lounge room, as usual, they were discussing the war and then the poor business in Great Britain. The Londoner said the conditions were caused by the high taxes to enable England to meet its indebtedness to the United States for war loans. He said that the taxes were enormous in comparison with the taxes in the United States and in comparison with what they used to be, and that they were practically bearing the whole expense of the war. I said that he was incorrectly informed regarding the taxes. Since 1913 taxes in Great Britain have been increased 217 per cent and in the United States they have been increased 204 per cent since 1913, which is not such an enormous difference. And as our average incomes are larger than yours, we are paying individually more taxes than you are. The result is that we will make and are now making a quicker recovery than you will do. With parallel indebtedness the United States should make a recovery to normal in one-third the time Britain would need, because we accomplish three times the work per capita.

Why is it that Englishmen and the rest of the nations that were engaged in the war **resent our recovery** and **prosperity,** and think we ought to cancel your indebtedness to us? Is it on the theory of **soak** the rich, the able, the saving, and the industrious and let the non-productive, the unwilling, and the loafers go?

Then the war was fought all over again and as usual there was the everlasting complaint about America being so long in joining them in the war. Their attention was called to Mr. Asquith's book on the war which was then being published in the Saturday Evening Post. In it he told of the close scrutiny the British Government had to make of the German acts to find a just cause for entering the war and had only done so when Belgium was invaded and the 'scrap of paper' incident was made known. How could America act until an act of war was committed against her, such as the sinking of the Lusitania? Finally, he indignantly said, "In America you claim that you won the war." To which I replied that no thinking man in America claims that we won the war. They give the British and French full credit for what they did. But what we do claim is, that the United States kept Great Britain and France from being licked, "and you know that's true."

That was the chief subject of conversation wherever we went; that and the hard times which were blamed on the labor problem.

HOLDING DOWN OUTPUT

I met a builder in the hotel at Lairgs where we had to wait for "high tea" and, as usual, the war and then the labor problem was the subject of conversation. I said that the trouble was mostly caused by labor doing a very small day's work, and that, with the taxes, put up the housing costs, making rents as high as they were in the United States. He said: "Yes, I suppose you are right," and said further that the wages in the building trade were between three and four pounds per week. He said that he had two men working for him who had been in the States for years, but when the prohibition laws were passed they had come back home. He said that they put up the biggest day's work he had ever seen and what I said was the same as they told him about a day's work in the United States. "But," he said, "I thought they were only doing 'Yankee blowing.' **They offered to do the same here if I would pay them the same wages.** I would not allow them to, for I wanted only good work. No man could do good work at that speed and it was bound to shorten men's lives."

I suggested that he look up the vital statistics for Great Britain and the United States and he would see that it doesn't. "Well, suppose it doesn't shorten lives," he answered, "what benefit would it be to me if I gave them three times the wages and I did get three times the work? They would be making more than me and I would be making no more."

Just think it over—how was that for efficiency.

While I was looking out of a hotel window in Oxford I timed a bricklayer working on a plain side wall. He laid forty bricks in one hour. In New York City during 1920 I have had an average of 1,500 bricks laid in eight hours. One of the men was 65 years old, an American of Irish descent and the other was an Englishman, and the one laid as many bricks as the other in building an elevator shaft through the old building. The building inspector said it was a first-class job. The Otis elevator man said the same and when plumbing it to install the elevator declared it was not a half inch out of plumb at any point, and that was unusual. On a side wall here a man should do more than 1,500 per day. The wages paid were $10.00 per day of eight hours. Compare the wages and bricks laid in the two countries.

In different parts of Great Britain I saw masons carving ornamental patterns on the stone fronts and cutting letters on gravestones. They were using the old chisel and hammer or the wooden mallet just like those Sir Walter Scott describes as used by "Old Mortality." I couldn't help compare it with what I saw when I was walking down Broadway, New York, on the day I bought the tickets for my trip. On the front of a building they were carving with a pneumatic hammer and chisel. They could do feet against the other's inch, and clearer, finer work.

On a sail we had up and down Loch Katrine from the

Trossachs end which took about four hours I met a farmer from Sussex, England, on a holiday. During our conversation I asked what was the reason the farmers of Great Britain were asking for a tariff on grain principally against the United States. Was it because the climate in England was poor or the land run down so that they could not raise enough bushels per acre? "Oh, no," he replied, "statistics show that we raise more bushels per acre than is raised in the United States." He asked what I thought was the reason that they could sell cheaper than the British. I said I did not know but that I believed that farm help was paid three to four times more in the United States than in England. He said, "That is so and that's what puzzles me."

"Then it appears to me that you produce too few bushels per labor hour," I answered. "Your labor costs must be too high in comparison with the American. Why don't you go over your costs and only raise such crops as you have found the most profitable in the past. If you have not got such data that you can assemble, you can probably get help from your Agricultural Department, and attend to your own cost compilations in the future. You may not be able to make full use of them but the young man here, your son, will be able to utilize them and carry the good work along. Get your manufacturing costs, give your men more wages and facilities, plan ahead, and get more work per hour."

RECEPTIONS BY BRITISH FOUNDRYMEN

When I was in Birmingham I noticed the sign of the British Cast Iron Research Association. I sent in my card and met the Secretary, Mr. Thos. Vickers, C. E., a very courteous gentleman. I told him I was in the jobbing brass foundry business in New York City, and if it was possible would like to get admittance to brass foundries in Birmingham to see the English practice, at its best probably. He explained to me that he could not be of any assistance to me, further than give me the address of the Non-Ferrous Research Association, and said that the research associations for the different manufacturing interests in the country were partly supported by the government and partly by the industry. These associations render two services. One is to compile and condense all of the articles published in the world and the different patents issued of interest or appertaining to the industry. This is printed and issued quarterly and is accessible to anyone. The other service was compiling the researches made either by the government, by private firms or by individuals. This was sent only to concerns which it would benefit in the British Empire and was held confidential. The combined research associations were meant to take the place in Britain of the American Bureau of Standards. Mr. Vickers said that where the Bureau of Standards receives millions of dollars in appropriations the British, owing to the war, received thousands of pounds and they were not able to operate as the Bureau of Standards does. "In regard to Birmingham," he said, "it undoubtedly holds the premier position of any city in the world in the non-ferrous industry. The last census showed that there were 50,000 persons in the Birmingham district engaged in that industry."

After fighting the war over again a little, the labor problem was brought up and the question of how much wages were paid to brass molders in Birmingham was asked. "Between three and four pounds per week," he said. "And the employers wanted to reduce the wages, and labor wanted them increased. Owing to the present depression the employers considered the demands of labor were out of reason." It was suggested that labor was not entirely to blame but that the employers were also to blame. In fact, that it was a national problem. The nation did not seem to me, industrially, to do one-third of a day's work in comparison with the United States.

If you compare the British census reports with the census bulletin issued by the Department of Commerce, Washington, entitled "Brass, Bronze, Copper and Allied Products, 1921," and which shows that in 1919 86,106 persons were engaged, the value of the products was $482,313,000, the cost of materials was $304,824,000 and the salaries and wages were $117,749,000. In 1921, 46,218 persons were engaged, the value of the products was $214,612,000, the cost of materials was $130,630,000, and the salaries and wages was $62,546,000, and you will see that in Birmingham they employ 50,000 persons on a 17,000 person job.

I went from there to the British Non-Ferrous Research Association. I met the Secretary there and stated to him my desire to see some of the jobbing brass foundries in Birmingham, but he was sorry he could not be of any assistance to me. The duties of this association were similar to those of the Cast Iron section. He showed me the library they had of books on the non-ferrous metals and the file of all the periodicals published for the industry in all languages which they kept for reference. Of course, they had on file THE METAL INDUSTRY and the other American publications. Then he told me that I might get what I wanted by going to the offices of the Employers' Association of Brass Foundries and gave me careful directions as to how to find them. He explained that the government had caused those associations to be formed for the industries to meet together and adjust matters with the labor unions, so they could all act in harmony for the benefit of the country, during the war, and in the endeavor to solve trade problems. It was continued after the war. It is my understanding that all the firms in the industry have to be members.

Calling at the address furnished I met the Secretary of the Employers' Association. I stated my business giving him my card. From his method of cross-examiantion I judged he must be a lawyer. His first question was, "Why do you want to see brass foundries here, and what do you wish to learn?" I answered curiosity mostly and explained that I had a fair knowledge of the methods and practice in brass foundries in Birmingham in 1890 and wished to learn if there was improvement in conditions during that time. As I considered that Birmingham was the largest center of the non-ferrous industry I wondered if the employers had the same troubles as in the United States—that of making flat prices by the pound for castings, a lack of knowledge on the part of the employers as to the cost of making castings and running a foundry, which caused a high percentage of failures, fool competition, poor prices for the product, poor working conditions for the men, continual friction about wages and poor returns for employers.

He replied that brass castings were not sold at a flat price per pound here. "They cannot possibly be sold that way. There are too many variables that enter into the cost as regards size, weight, difficulty of making the castings, etc. There can be no flat price on brass or bronze castings. The wages paid to molders was from three to four pounds per week. The output in molds per day depended on the variables in regard to making castings and the skill of the molders, etc. They had unwise competition caused by the lack of knowledge of costs but they were remedying that. In regard to the lack of cost knowledge the Employers' Association were doing a great service there and were very much helped by the trade publications. They paid particular attention to that feature. He was sorry, but in regard to my being allowed to visit foundries he had no control over that. He did not think he would be able to help me, but he would give me an

address of one and he would call them up on the telephone and apprise them of my coming to see them. The address he wrote on my card was not legible and I did not bother following it up. It was only a case of passing the buck right down the line. I could sense his hostility and his evasiveness all through the interview. Why should I bother?

There was an open road to Stratford-on-Avon, then to Oxford so we got in our car and went ahead. After seeing the sights in those places, we got to London, spending eight days there, including the week in which President Harding died. We visited Westminster Abbey a few days before the services were held for President Harding. It was a wonderful sight and our visit impressed us very much. Our days in London were full of sightseeing. Finally I got tired of sightseeing and I went to the publisher of THE METAL INDUSTRY in Great Britain and talked brass foundries to him. He said he knew the superintendent of a brass foundry who was a very open-minded and progressive man. He advised a call on him and gave me his name and address. I found the place and asked for the superintendent at the foundry office door. They asked for my card, gave it to the office boy and I was shown into a little office that seemed to be used for a buyers' or salesmens' room. It was all very private, secretive, and quiet. After waiting about five minutes a pompous, dapper little man came in and asked whom I wanted to see; what I wanted to see him about; the objects of my visit; and why this personal investigation? The American Foundrymen's Association were visiting Britain. Would they not cover the subject fully? And anyway Mr. ———— (the superintendent) did not have the authority to decide whether to admit me or not. He would have to make the decision. And they did not run a brass foundry, they only made—bronze, therefore it would be of no interest to me to visit their foundry and further owing to depression in business, stock taking, the Bank Holiday, and the dockers strike, they were shut down this week. So I asked his name, smiled on the nervous little man and went out. And that's how I came not to see that foundry in London. But there were others and I saw them.

GENERAL IMPRESSIONS

I found that Englishmen meet Americans with a great deal of hauteur, (hauteur with a capital H), and seem to resent the meeting of others than Englishmen as man to man. They seem to consider themselves as very superior indeed and, as Mr. Israel Zangwill is reported to have said, "more efficient than Americans." If they are more efficient industrially, why is it that they only turn out one-third the product per person? Why is it that they only pay one-third the wages paid to employees in the U. S. while living costs are as high as in the U. S.?

Sir Alfred Mond justifies the low wages by saying, as reported in an interview published in a New York newspaper, that the British workingman can live at one-third the cost of the American workingman. **They have to.** They only get one-third the wages paid to workingmen in the U. S. If this is efficiency, **may we be saved from it.** Americans are proud of the fact that workingmen live at a higher standard, that so many own their own homes and their automobiles, something unheard of in Great Britain.

When you make these statements in man to man fashion to Englishmen, they immediately revert to their manner of hauteur. More "yankee blowing," you sense, that they are thinking, and they don't believe you. They know it is not possible for them to do so, how is it possible for anyone else?

On the other hand, the average workingman sums it up as in the words of one young man, **"The old country is played out.** I want to drop it and go over there as soon as I can get away." When I suggested that in the United States he would lose some of his **'personal liberty,' he said,** "You mean through prohibition?" "Well I would rather lose that **fraction of liberty** than become a **liquor slave.** Just think of it, an American or a naturalized citizen who has sworn to obey the laws of the country, forswears and demeans himself by breaking such a law and drinks such stuff that I would not put on my boots."

The United States has problems in assimilating the many people from other countries, and we should select only the best that are offered. Britain has many problems to solve, but I have never been able to understand how she encourages emigration as she does, losing so much wealth in men, that benefits other countries. To bring each person to manhood costs about $5,000, there one way or another, and we are handed that man material for nothing and some cash along with it; they lose that much. That is one problem they have apparently never seen. It is a real national problem.

As I see it in Britain, what they have to solve is the fact that it is very unpopular for **employers to give a fair day's wage** and it is very unpopular for **employees to give a fair day's work.** Reverse those conditions and Britain would have **efficiency.** Britain would have prosperity for all. But I do not think they have a man big enough in Britain to see this problem as it is, and put the solution across, even to the extent that it has been done spontaneously in the United States.

Goldsmith says,

"Ill fares the land, to hastening ills a prey,
Where wealth accumulates, and men decay."

It might be changed to read,

"Ill fares the land to hastening ills a prey
Where initiative decreases and men loaf all day."

Manufacturing Brass Cartridges

Q.—Can you give me any information on the manufacture of brass cartridges for sporting ammunition? What sort of dies are used? How many draws are necessary? How many anneals? At what temperature?

A.—This subject is such a large one that it is impossible to give more than the barest outline without making the answer assume the proportion of an extended article. The nature of the dies does not vary materially from those used for commercial drawn work, excepting that they are usually made in groups or clusters of four or six. The number of drawing operations varies with the size of the cartridge. For instance, the 22 calibre rim fire cartridge, having three drawing operations, after blanking, with five or six operations following, before the cartridge is finished. These shells are annealed only once in a cast-iron drum which is revolved automatically for a period of thirty to forty minutes in a furnace heated to a temperature of from 930 to 1020 F.

The 30-30 cartridge receives four drawing operations after blanking, is annealed three times in the drum (at a temperature of 1150 to 1220 F.), and the mouth, only, is again annealed, automatically, in a machine constructed especially for this operation. This cartridge has thirteen operations, before it is finished, and with the exception of the hand labor used to feed the magazine, they are mostly automatic. The brass heads of shot shells are first blanked then annealed, and receive two drawing operations before receiving the paper tubes containing the shot.—W. F. HIRSCHMANN.

Casting Metals

A Variety of Melting and Molding Troubles and Their Solutions*

Written for The Metal Industry by WILLIAM J. REARDON, Foundry Editor

CASTING BLAST FURNACE TUYERES

Q.—Please send us information regarding blast furnace tuyeres to be made in copper, as regards core-box design, pattern design, moulding methods and melting methods and flux used in the copper. These castings must be 98% or better copper.

A.—The making of blast furnace tuyeres is very simple and is done as per Fig. 8. The molding is really a plain piece. The work is mostly in the core. You will note

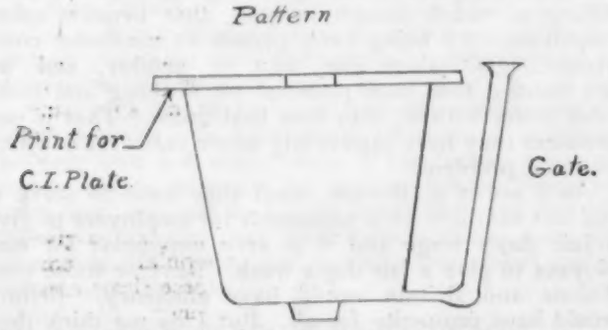


FIG. 8. GENERAL IDEA OF MOLD FOR BLAST FURNACE TUYERE

in Fig. 9 that the core is rammed upon a plate with a pipe bent so as to fit in the core and also to act as to give bottom thickness and hold core. Fig. 9 gives all the details of the core box. The jacket core is not shown, as it is a plain

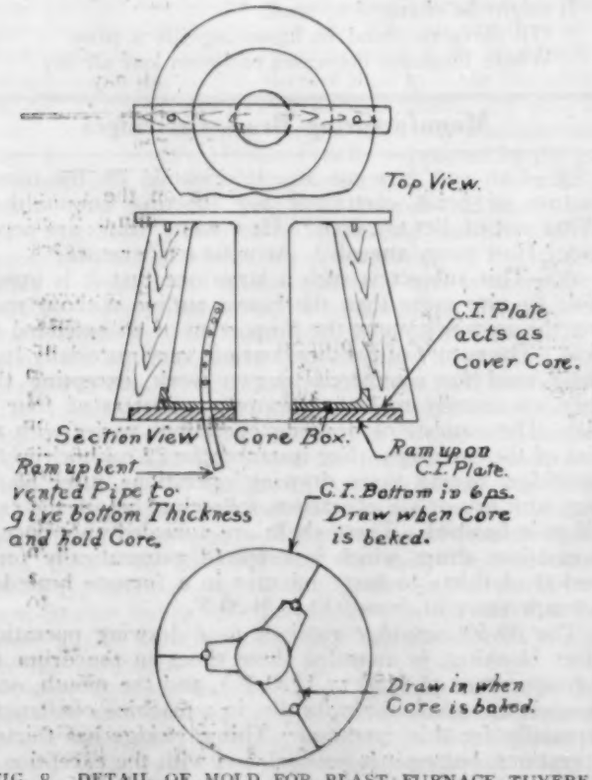

Top View.
C.I. Plate acts as Cover Core.
Section View
Core Box.
Ram upon C.I. Plate.
Ram up bent vented Pipe to give bottom Thickness and Hold Core.
C.I. Bottom is 6ps. Draw when Core is baked.
Draw in when Core is baked.

FIG. 9. DETAIL OF MOLD FOR BLAST FURNACE TUYERE

core. The best flux to use 6 ounces of 15% phosphor copper per hundred pounds of metal. The melting of the metal is very important. Great care must be taken in melting so as not to have the copper take up too much oxygen from slow melting. Keep the copper covered well with charcoal and melt rapidly.

The mixture for the core sand is important. A good core mixture consists of 40 parts open sand, lake or silica preferred for the jacket core. The center core can be 20 parts sharp sand, 20 parts molding sand and one part oil.

*Other problems in this series were published in our January issue.

ALUMINUM FISHING REELS

Q.—I am mailing to you under separate cover a casting which you will find upon examination to be cracked and I will try to briefly state just what I have done to overcome the difficulty.

At first it cracked on the rim and by putting a ring on the outside and gating it on to the rim I did not have any more trouble that way, but I have had nearly all the trouble by cracking at E. I have cast about 75 of the reels and have about 40 good ones without any defects and I have quite a large number to make but the loss is so heavy we are bound to lose on the order unless we get a better percentage of good castings. I thought possibly the metal might be too hot but I am satisfied that that is not the difficulty as I have some that cracked when the aluminum was hardly hot enough to run the casting and some were run and some misrun in the same heat.

I have made the cores so soft I could hardly handle them, but with no better results. I have taken them out hot and left some to get cold in the molds but not much difference. I have made some molds and left them standing for 2 days with the cores in in order to soften them but no difference. I have tried a dozen different mixtures from 98% pure aluminum to No. 12 but no better results. These aluminum reels are used for fishing, on a 4 ft. rod. We machine the centre hub, put a brass bushing in and a steel shaft on the bracket which clamps on to the pole. The whole is buffed, highly polished and quite clearly shows up any defects which may appear.

A.—I have examined the sample casting submitted very carefully, and I am of the opinion the trouble with this casting is the design, and I would suggest to fill in the fillets where sample casting is marked "E," somewhat like Fig. 10. This will eliminate the cracking. I believe the gate in the outside to be necessary to take up shrinkage and it may be that more gates will be necessary from the rim to the hub.

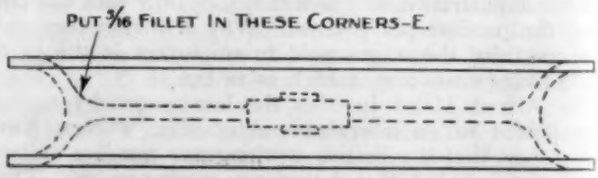


FIG. 10. ALUMINUM FISHING REEL

The metal looks good and clean, only the surface shows that the metal was poured on the hot side. No. 12 alloy properly handled should be all that is desired for this job. There are, however, several aluminum hardeners on the market that will assist in eliminating cracks and pinholes in No. 12 alloy, when not properly handled. One of these alloys consists of a mixture of the following:

Copper	4.99
Vanadium	.005
Chromium	.005
Aluminum	95.00

However, I believe the chief trouble in this case is not enough fillet on casting at mark "C." Very little more fillet will assist greatly.

Chromium Plating Steel

Discussion of the Paper Describing a Study of Chromium Deposition Using Cromium Anodes, and the Properties of the Deposit By K. W. SCHWARTZ*

H. K. RICHARDSON[1]: The past year or so we have had considerable experience with chromium plating. It has been only a portion of our problem, that is, the chromium plating is a tool for us. The other part of our problem requires tests which sometimes take three months, so in between time we leave our chromium plating bath idle until such a time as we start over again. We are using a continuous process, chromium coating of nickel steel wires, drawing the wire at a low rate of speed, about 2 ft. per min., through this plating bath and taking the deposit from a solution which corresponds exactly to the solution given in the paper.

One trouble is that as we increase the current density we get less and less deposit, until we get a brightly burnished, silver-like wire deposit. But we cannot determine accurately the thickness of plating on the wire; it is too small.

Confirming the observations of Mr. Schwartz, if we do not get an evolution of hydrogen, we do not get a deposit. Also, if we do not have a dirty wire, we do not get a deposit. I do not mean a dirty wire going into the solution, I mean that if the wire coming out has not a dirty film on it, we have not much of a deposit on it. This film is probably the chromous-chromic sulfate noted by Sargent in his original paper.

The bath is temperamental in other ways. For instance, a newly made up bath unless made up from the purest of materials will not work the first time you use it. Yet, a bath which is made up of technically pure chromic acid, will start to work in a short time if the pure bath is allowed to stand around and a little dust settles in it. What the reason is, I cannot say.

The Sargent solution, as recommended by the author, does the best work. We find that a current density of about 75 amp. per sq. ft. (8 amp./sq. dm.) of the wire surface is satisfactory for our conditions.

The amount of sulfate in the bath we know is an important thing. Too high a sulfate content causes trouble, for the deposit commences to get thinner and thinner until it disappears. Another interesting thing is that you can no use sulfuric acid in place of the sulfate. Why, I have not found out.

Sometimes we find that we have to cool the solution, and other times we have to heat it in order to get decent deposits. The reason for that I am not prepared to say. If at the start the bath will not work cold, we just run a little steam through and it works all right. On the other hand if the bath is hot and will not work, we run a little cooling water through the steam coil to start it working.

Regarding the structure of chromium coated wire, when the underbody is thoroughly well prepared by anode cleaning, the coating adheres so strongly that we can draw the wire to a small diameter without cracking the surface, providing that the temperature is kept above a certain point. We have found that chromium coated wire does not oxidize up to 310° C. Above that we have not tried it.

S. C. LANGDON[2]: How pure was the chromium that you made by the Goldsmith process, and how thick were the deposits?

WM. BLUM[3]: The formation of a brownish cathode film, noted by Sargent and others, may be due to the fact that whenever hydrogen is discharged at a cathode, the pH of the adjacent solution increases. As the solution becomes less acid there is a tendency for the formation og basic compounds. A study of the hydrogen ion concentration of the solutions might throw light on the of the cathode film. If such films are colloidal, their formation will probably be greatly influenced by small amounts of impurities.

S. E. SHEPPARD and A. BALLARD[4]: (Communicated): An investigation of the electroplating of chromoum, but chiefly on brass, has been proceeding for some time in this laboratory. We have thought it desirable to refer to our results, since they were obtained by following, with modifications, E. Liebreich's procedure[5], as so far published. Mr. Schwartz, in his valuable and interesting paper, does not appear to have compared Sargent's solution with Liebreich's, consequently we presume that the statement in his summary (3) "Best results were obtained using Sargent's solution containing, etc,," refer to modifications of Sargent's solution, and not to comparison of Sargent's with other solutions. Our solution was prepared by heating a chromic acid solution with moist chromium hydroxide. The results, using a rotating cathode, and a graphite anode enclosed in a canvas bag, were promising, and invited further work with chromium anodes, which is now in progress. Representative conditions and results were as follows:

Time in Min.	Current density amp./sq. ft.	Current density Amp./ sq. dm.	Voltage	Character of Deposit
120	93	10	5.3	Well adhering deposit of steel gray color
25	121	13	6.0	Very good adhesion; bright steel color
40	223	24	8.3	Poor adhesion; deposit flaked off easily

In general, the resistance of the chromium deposit to corrosion agreed with that described by Mr. Schwartz.

COLIN G. FINK[6]: About 98 or 99 per cent Cr deposits up to an eighth of an inch were made. That is as far as we went. I do not see any reason why we could not increase this. We obtained a silver-like deposit, a fine, smooth deposit.

COLIN G. FINK: I am at a loss to account for the high voltages obtained by Dr. Sheppard, when using graphite as anode. Their voltage is decidedly higher than the voltage we got using chromium anodes, voltages of about 2.5.

WM. BLUM (Communicated): Unpublished experiments made at this Bureau by J. R. Cain showed that when a piece of thin sheet plated with a chromium coating about 0.013 mm. (0.0005 in.) thick was cut so as to expose one edge, the latter was badly rusted in less than twelve hours immersion in distilled water. Zinc coated steel under similar conditions showed no corrosion on the edge for several days.

COLIN G. FINK (Communicated): Referring to Dr. Blum's discussion above, it is important to note that zinc coated surfaces are readily marred by scratches of wear, but chromium plated surfaces are very hard and not readily scratched.

*This paper was read at the Forty-fourth General Meeting of the American Electrochemical Society in Dayton, O., September 27-29, 1923, and published in THE METAL INDUSTRY, November, 1923, p. 441-3.

[1] Westinghouse Lamp Company, Bloomfield, N. J.

[2] Assist. Prof., Northwestern Univ., Evanston, Ill.

[3] Chemist, Bureau of Standards, Washington, D. C.

[4] Res. Lab., Eastman Kodak Co., Rochester, N. Y.

[5] Z. f. Elektrochem., 27, 74 (1921).

[6] Associate Professor, Columbia University, New York.

Diseases of Nickel Deposits

Symptoms, Causes and Cures

Written for The Metal Industry by WILLIAM VOSS, Electro-Plater

In my travels I find two solutions which are a constant source of trouble to the plater, namely nickel and brass. Nickel is more prominent because there is more of it used.

Very few factories have the necessary chemical apparatus to make a thorough analysis of their solutions. I say thorough analysis because if otherwise made, they prove valueless. The mere fact that a determination is made for metal content and acidity, which from the analysis will prove correct proves little. The solution may still show a very unsatisfactory deposit.

The following chart is drawn up to assist the plater to recognize his troubles and show him the causes and cures. When trouble arises in a deposit the original composition of the solution may have been entirely changed. I have in mind a case in which the salts were crystallizing up the sides of the tank and over the anodes. I stated that too much double salts had been used. The plater came back with the statement that no doubts salts had been used at any time, only single salts. But he did admit using plenty of sal ammoniac, which he did not know was converting his single salts to double. Nor did he know that he could dissolve three times as much single salts as double salts per gallon of water.

In recommending acidulating the solution I make no specific recommendation as to what acids are to be used. Sulphuric, hydrochloric, hydrofluoric, boracic, citric, etc., are all used. The use of any one or more of these acids in a solution have a particular bearing on the result. Each acid has a particular function to perform. The plater should know why he uses a certain acid and what acid not to use, as the case may be.

Another item which I might pass on and which is of vital importance to any nickel solution is the number of nickel anodes used per foot of tank, the type of anode and the percentage of nickel in the anode.

Flat anodes are a thing of the past. They do not present enough active edges. Another bad feature is that the back of the anode is up against the side of the tank. The round or elliptical shaped anodes are the best, provided such anodes do not insulate themselves from the conducting rod.

To save on nickel anodes or use low grade anodes is penny wise and pound foolish. Insoluble anodes should not be used since the solution is continually thrown out of balance. Such anodes are used in some of the plating establishments abroad.

I want to emphasize the matter of temperature. Try to maintain a uniform temperature. This is particularly true in the winter months. Solutions that are in first class condition will, owing to a drop in temperature, produce dark, dull deposits. Instead of looking to find his trouble, the plater will commence adding to his solution and throw his balanced solution entirely out of operation.

SYMPTOMS	CAUSES	CURES
Black deposits: Black, iridescent and comet streaks.	Zinc or foreign element.	Where the amount of foreign element is large, it is best to discard the solution, for it would be throwing good money after bad to try to save it.
Smutty, black or brownish black.	Copper or foreign element; check up with analysis.	
Dark deposits: Dark cloudy, but not black.	Foreign element such as zinc, copper, etc., where the amount is not so large as to turn deposit black.	If copper, acidulate with sulphuric acid. Hang sheet steel to precipitate out copper. If zinc is present, discard solution.
	Alkaline solution	Acidulate to slight acid reaction.
	Solution low in metal	Add nickel sulphate; also keep active anode surface large and clean.
	Not enough current	Generator too small, poor contact, anodes coated over, loose connections, salts crystallized on anodes.
	Lowering of temperature of solution	Raise temperature with steam through lead coil to normal temperature.
	Temperature too high	Heavy current (amperes) raises temperature. Use lead coil through which cold water runs to cool solution.
	Burnt deposits	Reduce pressure with proper rheostat and govern current by voltmeter reading.
	Single salt solutions low in metal	Increase metal content.
	Salts crystallizing out	Avoid saturated solutions. Avoid lowering of temperature as in winter months. If temperature is too low use lead steam coil to raise temperature.
	Solution may be bordering on any of stages of dark deposits.	See remedies for dark deposits.
	Solution too concentrated	Reduce with water, or raise temperature to normal.
Dull deposits: Deposit not clear but of grayish (lead) color, stains readily and requires cutting down with Tripoli before color buffing. Deposit cannot be color buffed without smudging the deposit.	Solution alkaline	Acidulate to slight acid reaction.
	Solution low in metal though hydrometer reading may be high. (Hydrometer readings are worthless, analysis is only method to determine exact amount metal per gal.	This is most common cause, the constant addition of double nickel salts and of conducting salts in large quantities. To add single salts to such a solution, converting it into double salts which readily crystallizes out in low concentration solutions, is wrong. It is best to reduce the density so as to reduce density of conducting salts, then build up with single salts to proper metal content, and get all other factors right.
	Usually due to lack of enough active anode surface, the solution is continually robbed of metal, high in non-metallic salts and low in metal.	Avoid low grade nickel anode. Avoid flat anodes since the active parts are its edges, and such anodes have but three edges. Also back of anode is practically inactive as it is almost up to tank.

SYMPTOMS	CAUSES	CURES
	Low grade anodes or insoluble anodes have same result of robbing the metal from the solution.	Elliptical shaped anodes have proven the best since they present all active surface and very little surface to side of the tank, and continue to remain active.
	Solution too warm or hot.	In some special cases, nickel solutions are used warm. Such deposits will be of darker tones.
	Weak current	Use proper voltage.
Thin deposits: Dull, thin deposit.	Solution alkaline causes deposition at an equivalent of metal in H gas. See dull deposits.	See cures for dull deposits. Acidulate solution. Increase time of depositing. Use proper voltage. Increase metal content. Increase conducting salts.
	Solution too weak	Bring up to proper strength.
Good deposit, but thin.	Not enough current, pressure (voltage) too low.	Use proper voltage, increase time of deposit. Keep contacts of rods, connections, racks, etc., clean. Avoid excess of acid. Sling wire, rack or hooks may be too light.
	Not plated long enough.	
	Solution low in metal.	
Bright deposit, but thin.	Solution too acid, depositing an equivalent of metal in H gas. Not enough current, voltage too low. Not plated long enough. Colloids act as buffers and tend to slow up deposition.	Neutralizes excess acid using preferably nickel carbonate. Increase current by increasing voltage. Increase time of deposit. Exercise care in the quantity of organic colloids used as brighteners.
	Solution too cold, salts crystallizing out.	Maintain normal temperature. Raise temperature with steam through lead coil.
	Anodes coated	Keep anode hooks clean. Prevent salts from crystallizing on anodes due to concentration or lowering of temperature. Clean anodes occasionally, brushing lightly with tampico brush.
	Lack of enough anode surface	Increase active surface. Increase number of anodes. Avoid heavy coated anodes or insoluble anodes.
	Violent agitation	If agitation is used, increase voltage.
Uneven deposits: Some parts receive heavier deposits than others.	Density of solution is not uniform, lower portions are denser. Work too close to anodes.	This condition usually exists in deep tanks. Stirring solution each night or slow agitation is best remedy.
	Poor conductivity	Where work is too close to anode, increase distance from cathode to anode surface.
		The addition of conducting salts to reduce resistance of solution.
Rough deposits: Though surface was smooth to start with, deposit is rough.	Burnt deposit, dark on points near anodes.	Reduce pressure (voltage) if deposit is dark and rough on edges.
		In scouring with pumice, lime or any abrasive be sure to rinse off thoroughly.
	Dirt or sediment on work either from cleaning operation or sediment from bottom of tank.	It is best to brush or sponge off such surfaces.
		Avoid hanging articles in sediment of tank or hanging work in tank after stirring it up.
		Keep surface of solution clean.
		Particles of iron dust will float on surface of solution and cover work when introduced into the solution.
Texture uneven: Upper portion of deposit is cloudy, lower clear or vice versa.	Improper rinsing; introducing alkalies into solution.	Use plenty of clean rinse water. Articles that have pockets must be thoroughly rinsed to remove alkali solutions and prevent contaminating nickel solution.

This article will be continued in an early issue.—Ed.

Cleaning Brass

Q.—I am interested in installing an electro-cleaning process for brass to be nickel plated. The brass has considerable tripoli and grease left from the buffing which has to be removed. What methods would you recommend; also, what voltage do you recomend for brass?

A.—I always advise for cleaning brass, that work be washed before coloring, as that removes exerything except the coloring compound. If that is properly done, it is a very simple matter to get first class results with brass. The ease with which brass will nickel or silver buff after coloring will almost pay for a coloring operation before, while the color is so much superior and the work looks so much better, and so little nickel is colored off that the expense is a standoff, with a much improved product.

Where firms cannot do this, I advise the use of a neutral soap that will rinse free in warm water, to soak the work, then a cleaner with straight current as for plating, (6 volts), using a good mild cleaner. Then a warm rinse, either a dip in a second cleaner or just a flash with reverse current. Great care must be used however to keep zinc from being deposited or rather contaminating the solution; then a dip in hydrofluoric acid, with a rinse, before entering the nickel tank. Brass, or any soft metal requires great care to avoid trouble.—E. W. Woodmansee.

Soldering Cast Iron

Q. What is the best method to follow in soldering cast iron? We have endeavored to solder some pieces and have not been successful.

A. Cast iron can be successfully soldered if care is taken in cleaning the work and the right acid and solder used. The cast iron must be thoroughly clean. The scale must be ground, chipped or filed off and the surfaces thoroughly tinned. The surfaces should be swabbed with muriatic acid in which zinc scrap has been dissolved. Heat the soldering iron very hot so that it does not burn the tin off.

It is sometimes advisable to pre-heat the work to be soldered. Use a solder made up of two parts tin, two parts lead and one part zinc, both for tinning and soldering the work.

For a harder solder to be used when the work is subjected to considerable heat, use 2 parts tin, 2 parts lead, and 1½ parts zinc. P. W. Blair.

Review of the Silver Market for 1923*

WORLD SILVER PRODUCTION

From estimates now obtainable it seems certain that the world's production of silver this year will exceed that of 1922 by some twenty-six million ounces, and will be approximately 239 million ounces, thereby establishing a new high figure for world production. The previous largest output was in 1912, when the figure reached 230,900,000 ounces. The United States shows a gain of some sixteen milion ounces, Mexico about nine milion ounces, while Canada and other countries remain about constant.

In other countries where subsidiary coinage debasement has occurred, quantities of silver thus released have been sold and added to this year's supplies of the metal. This reduction in fineness has been adopted by many countries following the example of England and Mexico. From London sources we learn that the amount of silver sold by the British Government due to the reduction in fineness of its silver coinage is 25 million ounces for this year, as compared to 24 millions for 1922, and that the imports from the Continent total 28 million ounces, consisting mostly of melted Austrian, Czecho-Slovakian and Russian coin.

FOREIGN DEMAND FOR SILVER

India, with a population of over 300 million souls, as a result of a favorable Monsoon this year, has shown a substantial trade revival. The demand for silver in India seems insatiable. Possibly the most important single factor is the native custom of hoarding and turning all surplus wealth into gold and silver jewelry, rather than trusting it to the banks in the form of cash or currency. Political disturbances have accelerated this hoarding tendency, and driven increased amounts of silver from circulation. The Bazaar demand for silver has shown no decrease but has been extremely heavy and constant. Shipments of silver to India this year will approximate 100 million ounces.

While political unrest still continues to disturb China and trade development has been hampered, nevertheless good crops, generally stable exchange conditions, firm prices of staple products, and a profitable export business in tea and silk have given great buying power to Chinese merchants this year and the demand for silver has more than equalled that of 1922.

The best authorities seem to agree that trade conditions for 1923 approximate those of 1922, although statistics indicate that shipments of silver to China this year will be close to 77 million ounces, an increase of about 10 per cent over last year's figures.

MANUFACTURES AND ARTS CONSUMPTION

The amount of silver used in manufactures and the arts is fairly constant. The last annual report of the Director of the Mint states the world's industrial consumption in 1922 as 59,869,000 ounces or 28 per cent of the 1922 world production.

England has used 4,000,000 ounces in the arts this year as compared to 4,500,000 ounces in 1922.

We estimate that the United States has consumed 29,250,000 ounces in 1923 as compared to 24,000,000 last year. Silver consumed in the manufacture of nitrates in this country will amount to approximately 5,480,000 ounces this year, which figure is included in the above total. These estimates refer only to net fine ounces of new silver and do not include old material remelted.

A graphic chart of our domestic silver industries would not show the upward curve during the past twenty years warranted by the increase in our wealth and population, and paralleling the growth of business in other lines. However, due to intensive advertising and educational propaganda by the silversmiths, there has been an encouraging increase the past few years. Photography and especially the thousands of miles of motion picture films now turned out annually have greatly increased the industrial demand for silver.

PRICES IN 1923

The market has ruled remarkably steady this year. The highest price for prompt delivery was:

New York.....68⅝c on March 27th.
London.....33-11/16d on December 18th.

and the lowest price:

New York.....62½c on July 30th and August 23rd, 24th and 28th.
London.....30½d on February 8th.

Sterling exchange has shown a marked decline during the year, which weakness has been generally reflected by a corresponding advance in the London quotation for silver. The sterling rate touched $4.71¾ on February 21st and dropped to $4.28 on November 19th.

OUTLOOK FOR 1924

It is much easier to deal with facts and figures than to predict what the coming year may hold in store for silver interests.

The fate of silver is so bound up with the economic and political conditions of the Orient that the student of finance will naturally first turn over in his mind the probable trend of affairs in India and China.

A survey of the latest news from India, as contained in the columns of "Capital" and the "Commerce Reports of the U. S. Department of Commerce" shows the general market conditions in India to be favorable, with business exhibiting a decided improvement.

In China, as already indicated in this article, the demand for silver has been large this year, and exports of merchandise from Shanghai to the United States for the first nine months, according to the report of Consul General Cunningham, showed an increase of almost 33 per cent as compared with the corresponding period of 1922; nevertheless general business conditions are unsatisfactory.

Turning to Europe, we can see no immediate demand for silver for mintage, but there are evidences that its people are becoming tired of money made from wood pulp and base metal and in time will insist on a return to silver coinage.

On the other hand we have the encouraging probability that the supplies of silver coming from the melting pot must soon diminish. It is remarkable that the silver market has not shown to a greater extent the effect of this European silver debauch.

We quote below the comment of a London authority:

> "As regards our view for 1924, we have little to go on. The present year has shown that India and China have been able to absorb increasing quantities of silver, and given any improvement in the Continental position, and a good monsoon in India, we do not see why they should not be able to do the same next year."

It would appear, therefore, that the controlling factor will continue to be the demand from India and China, and the requirements of these countries depend in turn upon world conditions.

*Abstracted from the 1923 issue of the booklet published annually by Handy & Harman, New York.

Ordering the Right Kind of Sheet Brass

Mistakes That Are Made by Purchasers in Ordering Sheet Brass. How to Specify the Desired Grades for Various Requirements

By JOHN L. CHRISTIE
Metallurgist, Bridgeport Brass Company, Bridgeport, Conn.

It frequently happens that a purchaser of sheet brass does not know the generally accepted meanings of the terms which he uses. The brass manufacturers have not as yet accurately defined these terms and the result is that often a purchaser orders one thing when he really

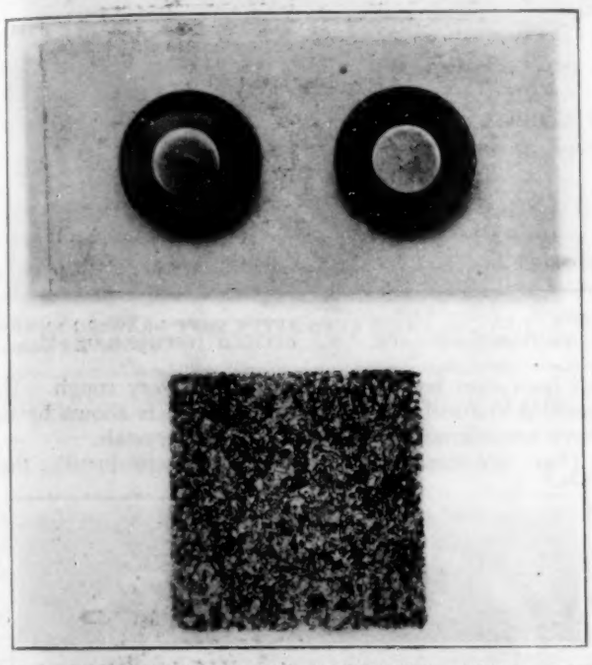


FIG. 1. SMALL SHALLOW CUPS AFTER LIGHT ANNEAL. PHOTOMICROGRAPH 75X. ETCHED WITH $NH_4OH+H_2O_2$

wants another. We have known instances in which a purchaser has ordered dead soft brass when he should have ordered light annealed brass. Through the examination of samples of satisfactory material or of the part which is to be made from the brass, the mill has learned what will be satisfactory and has supplied it. The mill has not, however, told the purchaser what he really wanted and the purchaser has continued to order dead soft brass and to receive light annealed brass. Sometimes the necessary information is not given to the producing mill with the result that unsatisfactory material is shipped, is complained about and is returned for credit.

Most of the sheet brass used in this country contains two parts of copper and one part of zinc. The chemical requirements are satisfactorily stated in Section II of American Society for Testing Materials, Specifications B 36-21. As indicated in Section III of this specification, this one mixture is susceptible to various treatments which produce widely different properties in the material and which fit it for widely different uses. In annealed brass it is possible to vary the properties very considerably by varying the amount of annealing. An anneal at a low temperature will produce brass with a relatively high tensile strength and hardness as determined by the Brinell test, a relatively low ductility and a relatively fine grain when examined under the microscope. By increasing the amount of annealing, brass will be obtained which has a lower tensile strength and Brinell hardness, a higher ductility and larger grains. By increasing the anneal still further it is possible to overheat or burn the metal which results in a further decrease in tensile strength and Brinell hardness, a reduction in ductility and the development of what is known as "beta brass" which is visible under the miscroscope.

The size of the grains as shown by the microscope determines the nature of the surface which will be obtained when brass is cupped and formed. If brass contains small grains the surface will be very smooth after cupping or forming. If it contains large grains the surface will be rough and will be what is known as "orange peel." It is obvious then that the greatest ductility of brass is obtained by giving it an anneal which enlarges the grain to such an extent that the formed surface will be rough. This point is very largely overlooked by purchasers of sheet.

The three anneals designated by the A. S. T. M. specifications (B36-21) are light anneal, drawing anneal, and soft drawing anneal. Light annealed brass has been annealed sufficiently to permit it to be worked to a moderate extent. It still retains a certain amount of stiffness and because of its fine grained structure it produces a very smooth surface on the formed article. Brass with a drawing anneal is suitable for most drawing and forming operations. Because of its grains of moderate size it will give a surface that is fairly smooth and that will not require an excessive amount of buffing. Brass that has received a soft drawing anneal is used for the most severe drawing operations. It has the maximum amount of ductility but this is obtained at the expense of smooth surface. The large grains produce a fairly rough surface after forming. The term "dead soft" indicates that a rough surface will be obtained.

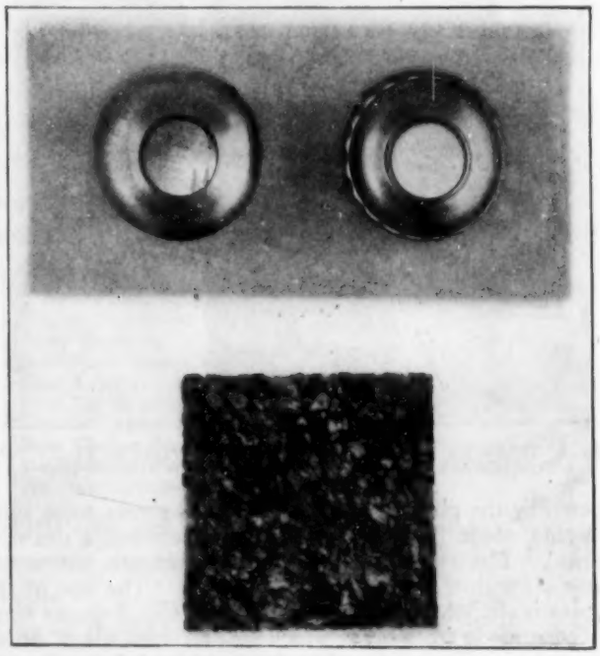


FIG. 2. SMALL SHALLOW CUPS AFTER DRAWING ANNEAL. PHOTOMICROGRAPH 75X. ETCHED WITH $NH_4OH+H_2O_2$.

FIG. 3. SMALL SHALLOW CUPS AFTER SOFT DRAWING ANNEAL. PHOTOMICROGRAPH 75X. ETCHED WITH $NH_4OH+H_2O_2$

The illustrations give some examples (reduced in reproduction). Fig. 1 shows two small shallow cups made from brass which had received a light anneal. Notice the smooth surface of the cups and the fine grain as

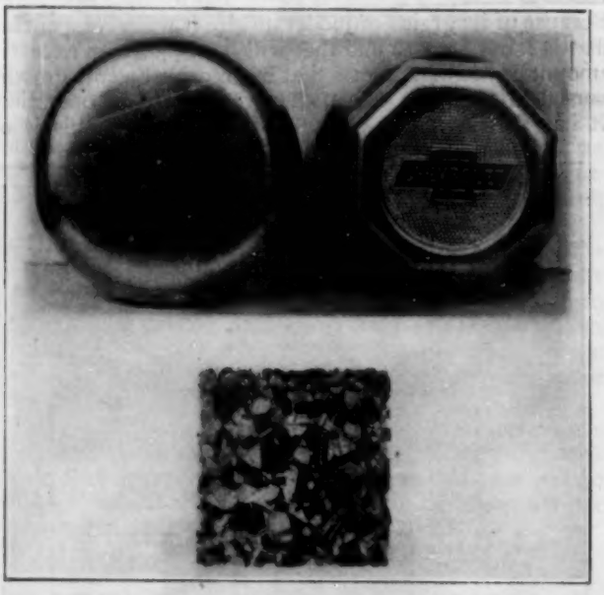


FIG. 4. HEAVIER BRASS CUPS AFTER DRAWING ANNEAL. PHOTOMICROGRAPH 75X. ETCHED WITH $NH_4OH+H_2O_2$

shown by the photomicrograph. Fig. 2 shows some similar cups made from brass which had received a drawing anneal. The surface is not quite so smooth but would clean up with a small amount of buffing. The size of the grains is slightly larger than in Fig. 1 Fig. 3 shows similar cups made from brass which had received a soft drawing anneal. The surface is quite rough and the grains are quite large. Fig. 4 shows two cups made from heavier brass which had received a drawing anneal. The surface is fairly smooth and would clean up nicely with a moderate amount of buffing. The photomicrograph shows the grain size. Fig. 5 shows two cups made from brass which had received a soft drawing anneal. The surface is extremely rough and the grain size extremely large. Fig. 6 shows cups made up from metal which

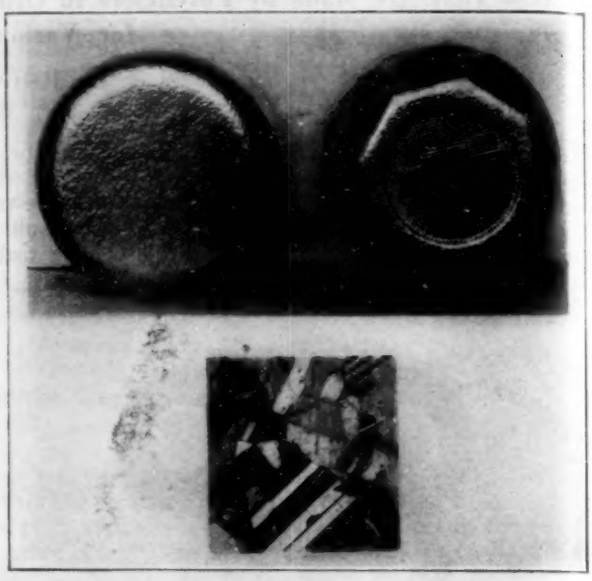


FIG. 5. HEAVIER BRASS CUPS AFTER SOFT DRAWING ANNEAL. PHOTOMICROGRAPH 75X. ETCHED WITH $NH_4OH+H_2O_2$

had been over heated. The surface is very rough. The fact that the metal had been overheated is shown by the heavy boundaries between some of the crystals.

There are some jobs which require more ductility than

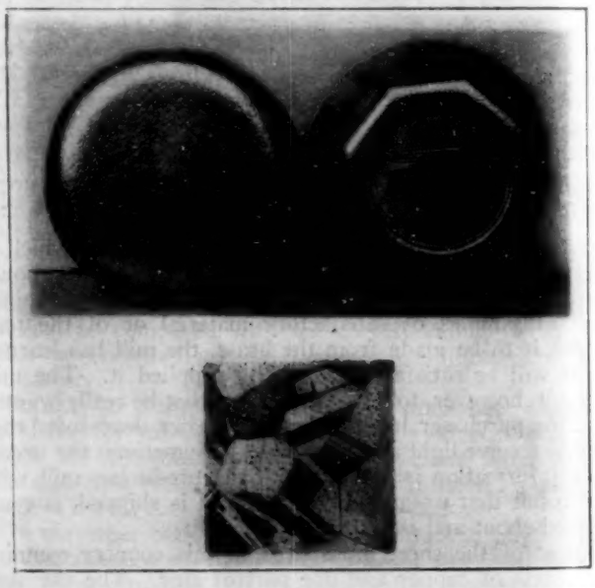


FIG. 6. CUPS MADE OF OVERHEATED METAL. PHOTOMICROGRAPH 75X. ETCHED WITH $NH_4OH+H_2O_2$.

it is possible to obtain in high sheet brass without developing the coarse grain. In such cases it is usual to specify cartridge brass, which contains 70% of copper and which is lower in the impurities lead and iron. (See specifications B19-19 of the A. S. T. M.)

The remarks have dealt only with brass which has been annealed as a final operation. Quite different properties are obtained if the brass is finished in the hard rolled state. These vary with the last anneal and with the amount of rolling after the last anneal.

A discussion of hard rolled brass will be the subject of a later article.

THE METAL INDUSTRY

With Which Are Incorporated

THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

Published Monthly—Member of Audit Bureau of Circulations

Copyright 1924 by THE METAL INDUSTRY PUBLISHING COMPANY, Incorporated

Entered February 10, 1903, at New York, N. Y., as second class matter under Act of Congress March 3, 1879

SUBSCRIPTION PRICE, United States and Canada $1.00 Per Year. Other Countries $2.00 Per Year :: SINGLE COPIES, 10 CENTS
Please Remit by Check or Money Order; Cash Should Be Registered

ADVERTISING RATES ON APPLICATION. FORMS CLOSE THE FIRST OF THE MONTH

Palmer H. Langdon .....Editor and Publisher
Adolph Bregman .....Managing Editor
George W. Cooper .....Advertising Manager
Thomas A. Trumbour .....Business Manager

ADDRESS ALL CORRESPONDENCE TO
THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK
Telephone Number: Beekman 0404. Cable Address: Metalustry

Vol. 22 New York, February, 1924 No. 2

Contents

The Metal Trades and the Radio Industry..... 53
Opportunities Which Metal Manufacturers Have Not Yet Grasped.
By RAYMOND FRANCIS YATES

Cutting Tools 54
By WM. F. HIRSCHMANN

New Uses for Metals..... 55
Conclusion of a Symposium on the New Uses for Metals Developed During the Past Few Years.

Power-Show 55

Molding Machine 56
Early History and Development. Simple Forms of Foundry Machines.
By R. E. SEARCH

Graphites for Brass Melting Crucibles..... 59
A Discussion of the Report From the Bureau of Mines Recommending American Graphites. Based on an Interview with Jonathan Bartley.

Impressions of British Brass Foundries..... 60
British Efficiency (?) As Seen by An American Brass Foundryman and Jobbing Foundry Operator.
By THOS. HARPER

Manufacturing Brass Cartridges..... 63
By W. F. HIRSCHMANN

Casting Metals 64
A Variety of Melting and Molding Troubles and Their Solutions.
By WM. J. REARDON

Chromium Plating Steel..... 65
Discussion of the Paper Describing a Study of Chromium Deposition Using Chromium Anodes, and the Properties of the Deposit.
By K. W. SCHWARTZ

Diseases of Nickel Deposits..... 66
Symptoms, Causes and Cures.
By WM. VOSS

Cleaning Brass 67
By E. W. WOODMANSEE

Soldering Cast Iron 67
By P. W. BLAIR

Review of the Silver Market for 1923..... 68

Ordering the Right Kind of Sheet Brass..... 69
Mistakes that are made by Purchasers in Ordering Sheet Brass. How to Specify the Desired Grades for Various Requirements.
By JOHN L. CHRISTIE

Editorials 72
Copper Consumption.
Metal Dust Explosions.
Trade Associations.
Ex-President Wilson.

Correspondence and Discussion..... 73

Technical Papers 74

Shop Problems 75

Patents 77

Equipment 78
A New Plant for Annealing Wire and Strip.
Ductile Tantalum.
Spray Tank.
New Spray Gun.
Hilo Crystallizing Lacquer.
New Finish and Rust Proofing.
Electric Solder Pot.
New Plating Supply House.
Rectifier for Plating.
Welding Equipment.

Associations and Societies..... 81

Personals 83

Deaths 84

News of the Industry..... 85

Review of the Wrought Metal Business..... 91

Metal Market Review 91

Metal Prices 92

Supply Prices 94

EDITORIAL

COPPER CONSUMPTION

The large users of metals were in the past year, as in the years before, electrical equipment, railroads, automobiles, marine equipment and ammunition. In 1923, the progress of these industries was varied, but on the whole upward. Electrical manufacturers continued to grow steadily. Railroads have been heavy buyers during a prosperous year. Automobiles, contrary to most expectations and in a way which few can explain, had a banner year. Their output has been enormous and in consequence their consumption of metals has probably been larger than they have ever taken. According to the Copper and Brass Research Association this total reached 170,000,000 pounds with a prediction that a consumption of 200,000,000 pounds was no longer a remote possibility. Marine equipment and ammunitions were small buyers but this caused little difficulty because they had, for a long time, been almost out of the market.

The building industries spent approximately 6 billion dollars in construction in 1923. Just how much of this went into metals has not yet been stated, but in view of the fact that in 1922 it was estimated by the Copper and Brass Research Association that this figure would be spent, and that it would offer a market for approximately 780,000,000 pounds of copper in the form of copper and brass, it is safe to figure that from 700,000,000 to 800,000,000 pounds of copper went into building. Undoubtedly, this situation played a large part in the unprecedent consumption of copper in the United States which obtained in 1923. In spite of the low price of the metal, it is obvious that the high rate of production could not have been kept up had it not been for the extraordinary expansion of the building industry, which to a great extent took up the surplus metal which had formerly gone abroad. Dull as the situation still appears for copper, one can only say that when and if European conditions are satisfactorily settled, or even settled at all, the metal market in this country should experience a rise of the most unusual character.

The feeling throughout business seems to be that the railroads will not be such large purchasers of equipment in 1924 as they were in 1923. They bought heavily last year to make up for serious deficiencies in their plants and stock; as a result they are now fairly well taken care of and can rest, for a while at least. They will not be out of the market, however, since the past year has been fairly prosperous for them.

Concerning the electrical industries, there is little to say. Their record is one of steady, continuous growth, in lean years as well as good. They take, consistently, over fifty per cent of all the copper produced. Their growth has been both sound and spectacular, forming, at once, the present backbone and hope for the future of copper.

METAL DUST EXPLOSIONS

A recent report by D. J. Price and R. M. Baker* of the Bureau of Chemistry, commands attention from all those engaged in the manufacture of metallic powders, particularly bronze powder. A printing establishment in Richmond, Va., suffered from this explosion which caused the death of an employee and wrecked a bronzing machine and its accessory equipment. The investigators made a thorough inspection of the process, the bronzing machine, its accessory equipment, the plant layout of which this machine was a part (including electrical connections, exhaust systems, etc.), and the effects of the explosion. From these investigations they decided that there had been a short circuit or a ground between the wire and the exhaust duct and that an electric arc from at least a 500-volt circuit had heated the point of contact to a high temperature. This was sufficient to ignite the aluminum bronze powder and cause a very rapid burning of the powder suspended in the air of the duct, resulting in the dust explosion.

Recommendations for the prevention of such explosions consist of cautions in laying out the installation. The dust collector and expansion chamber should be installed outside the building and all joints should be made dust tight as a precaution against static electricity. When the air is dry the machine and the ducts should be grounded. This can be done by connecting a No. 14 copper wire to a bolt in the frame of the machine, leading the wire to a water pipe close by and soldering the wire to the pipe. The dust collector should also be connected to a water pipe in the same manner. The copper wire should, of course, be protected from injury. Electrical inspection should be frequent and thorough.

As regards extinguishing aluminum dust fires, the situation is extremely difficult, due to the reducing action of hot aluminum on most substances used in the ordinary chemical extinguisher and to the chemical action between powdered aluminum and water. Sodium carbonate on red hot aluminum resulted only in an explosion. Foamite-Firefoam was wholly unsuccessful. It was found that ordinary sodium chloride (common salt) was the most satisfactory material to use. When poured on a pile of red hot aluminum it melted on the surface, and formed a thick crust which soon extinguished the blaze.

*Hazard of Flammable Dust Shown in a Recent Explosion of Aluminum Powders, by David J. Price and Robert M. Baker, Bureau of Chemistry, U. S. Department of Agriculture, Washington, D. C. Reprinted from Chemical and Metallurgical Engineering, Vol. 29, No. 20, November 12, 1923.

TRADE ASSOCIATIONS

A difference of opinion between two cabinet officers has claimed the attention of the business public during the last month. Attorney General Daugherty, in correspondence with Secretary Hoover, has placed certain limitations on the operations of trade associations, which, according to Mr. Hoover, will make it difficult, if not impossible, for the Department of Commerce to continue to co-operate with these associations.

Mr. Hoover's plan of co-operation was briefly that trade associations should compile current information about production, shipments, stocks on hand and prices, and forward this information to the Department of Commerce for filing and subsequent distribution to the members of the association. It was Mr. Hoover's idea that the presence of these statistics in the files of the Department of Commerce, and their accessibility to the public would prevent this procedure from being construed as in any way contrary to the existing anti-trust laws.

It seems, however, that Mr. Daugherty holds the dis-

tribution of this information among the members of a trade organization to be illegal.

Mr. Hoover states that there is now a great likelihood that associations will discontinue the collection of information and statistics. They will not go to the expense of collection if the only use that can lawfully be made of them is to transmit them to some Government department. He also fears that the efficiency of the Department of Commerce in helping industry will be greatly impaired.

It has been stated that the Attorney General may issue additional statements shortly, clarifying the position of the Department of Justice concerning the collection of trade associations and thereby ending all controversy.

It is sincerely to be hoped that this will be done, but it is also to be hoped that the end will be one which will permit business to obtain the information which it finds indispensable. It seems that there is no solid precedent for action in such matters, and that we are passing through a period of test cases in order to form just such a precedent basis. A period of this sort is always a trying one; not only trade associations but individual and business organizations find it difficult to guide themselves, since they may at any time be caught up for a transgression which is difficult to determine. It must be recognized that trade associations are here to stay. They are an economic necessity to progressive business. They cannot continue as honorary bodies or as social organizations; they must serve some vital purpose, and it is to the interest of everyone, in or out of trade organizations, that these purposes be definitely settled and information given, once for all, telling them what they may and may not do.

EX-PRESIDENT WILSON

On February 3, 1924, Woodrow Wilson, President of the United States from 1912 to 1920, died after a short illness. He had been an invalid for nearly five years, following his breakdown on a speaking tour, near the end of his second term.

It was a strange freak of fate that Woodrow Wilson, who was a worker and advocate for Peace, led the United States during its participation in the greatest war the world has ever suffered. As Commander-in-chief of the Army and Navy, he mobilized not only the fighting forces, but also the industrial forces, the producing power of the nation.

Almost overnight, the metal working plants changed from plowshares to swords; from brass knick-knacks to cartridge shells. We had to build, not only ships, but shipyards to build those ships, and plants to make steel for those shipyards. Through the Council of National Defense, the War Industries Board and the Federal Trade Commission he enlisted the wholehearted cooperation of manufacturers and men in a way that stamped him as a notable leader. With a minimum of legislation, but with the help of outstanding industrialists, such as E. H. Gary, Charles M. Schwab, J. Leonard Replogle and B. M. Baruch, ordnance and munitions plants increased from twenty or thirty to eight thousand and production increased in like proportion. In our industries, C. P. Goss, C. F. Brookes, F. J. Kingsbury, L. H. Jones and A. V. Davis, served on committees under Judge Gary.

Woodrow Wilson was a war casualty. He fought his fight and now has made the supreme sacrifice. Few presidents have played such important parts in political and industrial history.

CORRESPONDENCE and DISCUSSION

Although we cordially invite criticisms and expressions of opinion in these columns, THE METAL INDUSTRY assumes no responsibility for statements made therein

MAKING METAL PATTERNS BY ELECTRO-DEPOSITION

To the Editor of THE METAL INDUSTRY:

As I yield to no man in my respect for the ability of your Foundry Editor, Wm. J. Reardon, I hesitate to express my views on his recent article entitled, "Making Metal Patterns by Electro-Deposition." William Reardon gives credit for the development of this process to A. K. Laukel of Detroit, Mich., and right here I differ with that statement, as the method is as old as electro-plating, and not at all satisfactory; and again, anything but cheap in final price in the duplication of patterns.

Without going into details, let me enumerate the various steps necessary in attempting to produce this class of work, which consumes all kinds of time with mighty poor results.

First, the preparation of the original pattern insofar as smooth surfaces are concerned; the placing of it on a smooth plate and holding it there; then the preparation of the cast material, wax, litharge, plaster paris, or metal (if the pattern is made of metal); then the very careful removal of the cast and its preparation for the proper reception of the electro-deposition, which should include an allowance at the joint for the absolutely necessary "touching up" in matching the halves before placing same on plates.

Now assume that the plating has been evenly distributed (and it very seldom is), the extremely thin resultant shells are about ready to be filled up or rather "backed up" with white metal of some kind or other, and so carefully poured as not to slop over the edges of the shells, yet filling them. (Some stunt.)

So now we have a shell loaded with metal which, when cool, shrinks away from its captor (unless bismuth is used), and because of the shell's uneven thickness has transformed the beautiful outside surfaces to a series of undulating hills and valleys, same to be filed off and filled up eventually.

If the operator has survived all of these operations without making application for entrance as an inmate of an old man's home, he will have to show for all of his pains a well botched and costly set of patterns not comparable in cost and quality with the well-known methods in vogue today for the production of such.

As this wonderful (?) method has a habit of cropping up every five or ten years or so, it is not surprising that a new crop of victims are dazzled by its impossibilities only to realize after paying the price, that the same money spent in "bucket shops" would have returned the usual zero profits for which they are notorious.

WM. H. PARRY.

Brooklyn, N. Y., December 12, 1924.

To the Editor of THE METAL INDUSTRY:

I yield to Mr. Parry and will answer his criticisms as one who has been dazzled by the so-called impossibilities that have arisen in the development of the process for the production of metal patterns by electro deposition.

In the year 1836 De la Rue,* when using Daniell's battery

*A Treatise on Chemistry, H. E. Roscoe, F. R. S., C. Schorlemmer, F. R. S.

observed that the copper plate is covered with a coating of metallic copper, which is continually being deposited; and so perfect is the sheet of copper thus formed, that, on being stripped off, it has counterpart of every scratch of the plate on which it is deposited. (Phil. Mag., (3), 1836, 9,484.) This observation was followed up by other physicists, and in 1839 Jacobi of St. Petersburg published his Galvanoplastic process, a method of converting any line, however fine, engraved on copper into a relief by a galvanic process, applicable to copper plate engravings, metals, stereotype plates, ornaments, and to making calico printing blocks, and patterns for paper hanging. (Athenæum, May 4, 1839.)

Since this work has been done some eighty-six years ago I would like to ask if metal patterns in the form they are used today were known or used at that time?

Mr. Parry states that the product obtained is not at all satisfactory and is anything but cheap in final price. If any man can make a cost analysis on any new product without knowing each individual step in the process, he is not the ordinary man of today but a super-being, blessed with some unknown talent. I might state that he has never produced a pattern in this manner because in checking up the applications for entrance to the old men's home in the vicinity of Brooklyn I do not find his name on the waiting list.

It has been stated the preparation of the original pattern as to smooth surfaces consumes very much time. I might ask if it is necessary to have any different surfaces when patterns are reproduced by electro-deposition than one would use in the present day foundry practice. It is known that in electro-deposition process the surfaces obtained are exact reproductions of the original. If the original is suitable for sand molding whether it be wood or metal why not the reproduced product likewise?

After the smooth pattern is produced Mr. Parry states that it is placed on a smooth surface and then held there. This question is very vague. I might answer by saying that I do not have to have a perfectly smooth surface insofar as I have taken a gate pattern and produced perfect halves from it without altering the original in any way.

It is stated that a very careful removal of the cast is then made, but I beg to disagree with this statement, because a removal of the cast is not made. I always make a removal of the pattern and the difficulties that arise in its removal are less than occur in removing a pattern from the sand.

I never make an allowance on joint of pattern. This is all taken care of in the deposition and then in subsequent machining or disking of joint.

It is next stated that the plating is not evenly distributed and the shell obtained is extremely thin. I agree on the first point but not on the second. Thin shells are obtained if that is desired, but thick shells are equally as well obtained if one is equipped to produce such. Any irregularities of thickness on a split pattern make little or no difference as long as the thinnest point will stand up under all conditions in the foundry.

Mr. Parry has published an article on the Nickel Plating of Production Pattern Plates. THE METAL INDUSTRY, Vol. 21, page 358. He mentions in the beginning paragraph of his article the plating of acute angles or deep, narrow pockets with nickel. I would very much like to know how he does this, without obtaining some of the thin spots that he already says occurs in my process? If Mr. Parry has no objections I would like to add a few words to the following sentence that occurs in the same article. It is stated that electroplating is an art not acquired in a day. It would read much better as follows, "Electro-plating **including electro deposition processes** is an art not acquired in a day."

He says the backing up of the deposits is some stunt. I beg to disagree. It is not. It is no different from the filling up of an open sand mold. The deposits are imbedded in the sand and the metal poured into them. If Mr. Parry considers this a stunt I would like very much to see or hear of some of the real stunts that he is responsible for.

After filling up the shell it is stated that it shrinks away from its captor (unless bismuth is used). This group of words (unless bismuth is used) is worthy of note and I will dwell on said group of words. If one will re-read or recall the article "Between Blue Print and Production," written by Mr. Parry, published in THE METAL INDUSTRY, January, 1921, page 5, in the chapter headed Master and Grand Master Patterns, second paragraph, are the following words: "The so-called white metals do shrink, and are altogether unreliable, no matter what their constituents are, yea, even with the addition of bismuth, which the text books will inform you prevents shrinkage, and in fact makes the casting larger, when as a matter of exact fact nothing of the kind occurs." Now I might ask why these contradictory statements? When bismuth is used for white metals in the production of patterns, shrinkage occurs, yet when used in filling up deposited shells it does not. It might be of some advantage for Mr. Parry to learn that there are a good many other alloys that do not shrink, yet contain no bismuth. One of the most recent books on metals will give him this information. Metals and Their Alloys, by Charles Vickers, 1923, page 508, Antimony-Lead Alloys, Expanding, page 152-163, Expansion, Copper-silver Alloys and Lead-Silver Alloys, with less than 30 per cent silver; also in Tin Antimony, and Lead Antimony alloys.

It is stated because of the shell's uneven thickness the beautiful surface is transformed into a series of undulated hills and valleys, when filled up with white metal. Does this mean that the thin spots produce valleys and the thick spots the hills or vice versa? I might state in passing that I have produced a good many patterns with hills and valleys, but it so happened that these always occurred on the original patterns that were reproduced.

In conclusion I wish to state that I have survived all of these operations and I am still a young man, willing to reproduce at any time a working pattern for Mr. Parry, that will prove all the statements that I so far have made. And for the information of the trade I wish to state we are making these patterns every day for some of the largest foundries in Detroit and the reports we get is that patterns made by this process are superior in every way to even iron patterns. There is less wear and they work far more satisfactorily than any patterns made of cast iron, aluminum or brass. In fact, one foundry reports that operators fight to get the patterns, made by this process, in their molding machines.

A. K. LAUKEL.

Detroit, Michigan, January 15, 1924.

Technical Paper

EFFECT OF SEVERE COLD WORKING ON SCRATCH AND BRINELL HARDNESS*

BY HENRY S. RAWDON AND WILLARD H. MUTCHLER

BUREAU OF STANDARDS, WASHINGTON, D. C.

SUMMARY

1. The hardness changes that occur in metals as they are progressively cold rolled were measured by means of the small Brinell testing set and by the scratch-hardness method.

2. During the initial stages of rolling, the metal hardens rapidly. A maximum in hardness is reached, however, at a relatively low-deformation ratio (initial thickness to final thickness) and a reversal occurs, the metal becoming softer as the deformation is continued. In most cases, the severely cold-rolled sheet was softer than the metal in its initial condition.

A. All the metals used gave the same general form of hardness-deformation curve.

4. Annealing the cold-rolled strips at a low temperature (100° C.) softened all of them appreciably. The general form of the hardness-deformation curve was still maintained, however.

5. All the cold-rolled strips of any series, after full annealing, gave the same scratch-hardness, thus showing that the test results were independent of the thinness of the strips.

6. During the hardening period in continuous cold working, deformation of the crystals by slipping occurs. In the severely cold-rolled specimens that showed appreciable softening, all evidence of the previously existing crystalline condition had been destroyed.

*Abstract of a paper to be presented at the New York meeting of the Institute of Metals Division, February 18-20, 1924.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. REARDON, Foundry; PETER W. BLAIR, Mechanical; LOUIS J. KROM, Rolling Mill; CHARLES H. PROCTOR, Plating-Chemical; R. E. SEARCH, Exchange-Research }

ACID PIPES

Q.—I want to install an acid dipping arrangement and would like to know the best kind of piping to use for the waste water. Can it be connected to the iron piping in the cellar?

A.—Ordinary lead pipe containing one per cent of antimony will answer your purpose as a drain pipe for acid dips and pickles, to extend through the floors to the sewer pipe in the basement. As the sewer pipes are usually cast iron, you can make your lead pipe connections direct. Cast iron is a very good acid resisting metal.

The best way to arrive at an estimate is to figure out the size of the lead pipe you intend to use. Estimate the running feet of pipe it will require to extend through the four floors and make your necessary connections. Get in touch with wholesale plumbers or dealers in lead pipe and get an estimate of the cost per pound. Then get in touch with a plumber used to such installations and get his cost of installation. You will then know for a certainty the cost before you proceed.—C. H. P. Problem 3,292.

HIGH TENSILE BRASS

Q.—We require a mixture of approximately 53 to 62% copper; 36 to 54% zinc; 5% aluminum, and not over .15% lead; the tensile strength to be 70,000 pounds per square inch; elongation 20% in two inches. We believe that about 2% of manganese should be added to this mixture to make the tensile strength up to the required specifications. We would thank you to advise us of a mixture that would give this specification.

A.—The tensile strength you are required to meet is not difficult and the elongation of 20% is not asking too much. These requirements are very easily met from a manganese bronze or a very cheap imitation of manganese bronze consisting of 58½ copper, 41 Horse Head zinc or some other good brand of zinc and ½% aluminum. This mixture, in order to meet your requirements must be handled as follows: melt the copper in a crucible furnace. The brand of copper should be electrolytic or Lake and a good grade of zinc. Get the copper good and hot, then add the zinc a little at a time; stir well and then add the aluminum. If this mixture is handled properly, it will meet your requirements. This, however, is not the real mixture that should be used with first-class work. The genuine Parson manganese bronze is by far the best grade. It was discovered by Percival Parsons of England in 1876. To make this mixture, it is necessary to prepare an alloy of ferro-manganese, iron and tin. A very high temperature is necessary to alloy this metal properly. If not alloyed right, very poor results will be obtained. The alloy is composed of Norway iron chippings 36 parts; 80% ferro-manganese 8 parts, Straits tin 20 parts. Melt and pour in ingots, and use as follows: Melt 56 parts of copper. Get copper good and hot and add 2½ parts of alloy, stir well, add 43 parts of zinc, then add 8 oz. of aluminum and stir well.

If the work has been done properly, no trouble will be experienced in getting from 65,000 to 75,000 tensile strength, 20 to 30% elongation. The melting of such metal requires, careful attention, also the gating and placing of the risers on the mold. The information you desire from a book can be had by looking over THE METAL INDUSTRY which can be found in any good public library. We would suggest that you look over the back numbers, and are sure you will get information which will help you considerably on this class of work.—W. J. R. Problem 3,293.

CAR BOX METAL

Q.—What is a good mixture for car boxes?

A.—A mixture for car boxings that the most scrap can be used in, would be one in which as much lead as possible could be added to the scrap. A good red brass scrap, free from aluminum, will take up 8 per cent lead by adding ½ lb. of 30 per cent manganese copper to the 100 lbs. of metal.

We would suggest the following mixture:

Copper	35
Lead	12
30% Manganese Copper	1
Red brass scrap	50
Tin	2

W. J. R. Problem 3,294.

METAL FOR TANK LININGS

Q.—We are wondering if you can give us the following information:

1. Can Monel metal sheets be applied to acid tanks to replace lead?
2. Can it be welded successfully?
3. Will it withstand vibration?
4. Will nickel chromium withstand the above conditions?
5. What thickness is recommended for lining tanks of 500 gallons' to 1,500 gallons' capacity in a sulphuric acid and sodium chloride solution 5% by volume at 180° F.?
6. Have tanks lined with this metal proven more economical than lead and have they to your knowledge been adopted by any organization?

A.—1. Monel metal is an acid resisting metal to a great extent. It could be used to replace lead in sulphuric acid pickling operations, providing no bichromates are added to the pickling solution.

2. The metal can be welded successfully by the aid of the oxy-acetylene gas.

3. The metal has great tensile strength and is malleable and ductile, so should withstand any normal vibrations.

4. Nichrome could be used upon the same basis. However, it is much harder than Monel metal.

5. Not less than 1/32" thick if either metal is used. The lining should be built up upon a skeleton wooden frame and welded upon the frame. The weld would then be the underside of the lining.

6. We have no data covering firms which have used these metals as linings for pickling tanks.

Lead appears to be the most commonly used for such purposes. —C. H. P. Problem 3,295.

MIXING LEAD AND COPPER

Q.—We mix lead and copper in certain proportions with very satisfactory results. In other proportions the results are not satisfactory. Can you give us some information about lead-copper mixtures?

A.—To mix lead in all proportions up to 60% lead and 40% copper, one of the best methods is to treat the lead by mixing it with the form of galena ore. Melt the lead and 1% galena ore and pour into ingots. Then melt the copper and add the lead. Make gates on castings small and flat like gating for an iron casting.—W. J. R. Problem 3,296.

NICKEL ITCH

Q.—For plating nickel I use a solution composed of the following:

12 ozs. single nickel salts
3 ozs. Sodium Chloride
3 ozs. Boric Acid

We have a great deal of trouble with nickel itch. What is the best substitute for sodium chloride in our formula? I think that is what causes our trouble.

A.—We do not believe that chlorine evolved from the solution as a gas during the electrolytic action of the plating solution is the true cause of the disease.

If this were true, then any form of combination of chlorine yielding salts would produce the same results. These salts would be ammonium chloride, nickel chloride, sodium chloride and potassium chloride. It is our opinion that it is the metal itself that is the true cause of the trouble. Lead and many other metals affects some persons more than other—so does nickel. Thirty-five years ago when practically only the double salts were used (nickel, ammonium, sulphate) the same disease was prevalent. Nickel chloride is being used extensively in the plating industry to replace other chlorine bearing salts in nickel plating solutions. Use 2 ozs. per gallon where you now use 3 ozs. of common salt.—C. H. P. Problem 3,297.

NICKEL ON TIN SHEET

Q.—1. What is a good formula for a combination copper strike and cleaner for tin before nickel plating?

2. What is a good formula for a nickel solution for the above-mentioned tin? The material is plated in sheets, later to be drawn, bent and blanked.

3. Sometimes the nickel peels. Is this the fault of the cleaner or is the nickel too hard?

4. What is the cause of the sheets burning on the corners in the strike and cleaner?

A.—In nickel plating sheet tin in connection with an electro cleansing and copper plating solution, the following formulae have given excellent results:

Electro Cleansing and Copper Plating Solution:

Part No. 1. Cleaner:

Water	1 gal. Temp. 120° F.
Caustic Potash	1 oz.
Tri Sodium Phosphate	1 oz.
Soda Ash, 58%	1 oz.

Dissolve all the salts in the order given using about 90% of the total amount of water.

Part No. 2. Copper Solution:

Sodium Cyanide, 96-98%	1½ oz.
Copper Cyanide	1 oz.
Hyposulphite of Soda	5 grains

Dissolve No. 2 in 1 pint of hot water, 140° F., in the order given and then mix with No. 1—the cleaner in which 7 pints of water was used.

A steel tank should be used preferably, and copper anodes connected direct. If a wooden tank is used, then heavy sheet steel should be used as anodes, extending the length of the tank. To the steel anodes attach direct a few copper anodes on each side of the tank. Use from 4 to 6 volts. Replenish the solution with a little sodium and copper cyanide, a little caustic potash and a few grains of hyposulphite of soda to keep the copper deposit bright and clear.

Nickel Solution:

It is advisable to use only a double salt solution in nickel plating tin and of low density. We give you two solutions, containing however some single salts:

No. 1		No. 2	
Water	1 gal.	Water	1 gal.
Double Nickel Salts	5 ozs.	Double Nickel Salts	8 ozs.
Single Nickel Salts	1 oz.	Single Nickel Salts	2 ozs.
Boracic Acid	3 ozs.	Boracic Acid	3 ozs.
Sal Ammoniac	1 oz.	Sal Ammoniac	1½ oz.
Muriatic Acid	1/32 oz.	Muriatic Acid	1/16 oz.

In solution No. 1 tin has been nickel plated direct without direct copper plating. The deposit is adherent and tenacious. Voltage 3 to 4.—C. H. P. Problem 3,298.

PALLADIUM PLATING

Q.—Will you kindly advise if you can give us any descriptive literature on palladium plating for copper reflector. We understand that this is a new method of plating headlight reflectors, and will indeed be pleased to hear from you regarding same.

A.—The deposition of palladium is not a new method. It has been referred to in works on plating for more than 30 years.

The cost of palladium, which is in the platinum group of metals, is too high to be used as a commercial metal. The present price of the metal is $80 per troy oz. or four times as costly as fine gold. There was an article published in the World's Advance in the early part of 1923 entitled "Electroplating of Palladium by a New Process." Presumably someone interested has referred this article to you? There is nothing new in this article. Even the formula is a reproduction of what has already been printed.

An exactly worded formula can be found on page 540 of "Electro Deposition of Metals" by Langbein, 8th edition, published in 1920.—C. H. P. Problem 3,299.

PITTED NICKEL

Q.—I have noticed in some of your issues that you prescribe air agitation for nickel tanks plating die castings. Our greatest trouble in this work is pitting, which shows up after buffing.

A.—Mechanical agitation of the cathode or work rods is advisable and in our estimation gives the most satisfactory results. Mechanical agitation is not a difficult problem. In a plant in Chicago, we believe, all their nickel tanks are mechanically agitated having a horizontal motion to give the work rods a backward and forward motion of 6 to 10 per minute. The work rods should rest upon grooved iron or brass pulleys, set up with brackets at each end of the tank. The work rods move rapidly upon such pulleys. Your master mechanic or machinist can arrange for the power, either by a geared motor or pulley belt connected.

You can use air if you desire but your solution should then be constantly filtered. Do not use too high a pressure—just a gentle agitation of the solution is all that is required.

Pitting is due to hydrogen gas occlusion in the nickel deposit. The addition of small amounts of nickel carbonate to reduce the acidity of the nickel solution is the usual remedy. You may, however, obtain much better results in the control of the pitting by reducing the acidity of the nickel solution with carbonate of magnesia. The carbonate becomes converted to the sulphate by the neutralizing action and forms sulphate of magnesia—the well known addition agent for nickel solutions. Add from ⅛ to ¼ oz. per gallon as a trial basis in a test solution of say, 20 gallons and note results. If the addition overcomes your pitting, treat your entire solutions accordingly. A little of the carbonate of magnesia can be hung in the solution afterwards in cheesecloth bags constantly to neutralize any free acid that may develop.—C. H. P. Problem 3,300.

POLYCHROME FINISH

Q.—How can I produce a polychrome finish?

A.—The basis from polychrame finishes is brass usually with a scratch brush finish and gold lacquered.

If the articles are made of solid brass, they may be acid dipped, scratch brushed and lacquered. If of other metals (steel, zinc or antimonial lead) it is necessary to brass plate with a uniform yellow brass deposit. After plating, scratch-brush dry and gold lacquer.

After lacquering and when the articles are thoroughly dry Japan colors should be applied. Masury Paint Company's Japan colors are rich in tones and give excellent results.

Several of the lacquer manufacturing companies advertising in the METAL INDUSTRY can also furnish you with polychrome enamels.

Scratch-brushed silver surface and also nickel-plated surfaces finished in a brush finish and finally lacquered make a satisfactory basic finish for polychrome.

Considerable plaster of paris objects are finished in polychrome. A gold bronze mixed with a gold lacquer is the usual basic finish. —C. H. P. Problem 3,301.

REMOVING EMERY DUST FROM GRINDINGS

Q.—How can I get emery dust out of brass grindings?

A.—The best way to remove emery dust from grinding is to smelt them and pour into ingots, using a flux consisting of:

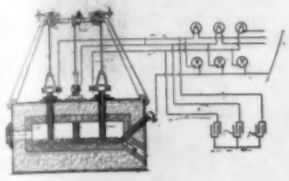
Soda Ash	25 lbs.
Salt	25 "
Plaster of Paris	25 "
Fine Charcoal	25 "

Mix 10% of the flux with the grindings and melt together in a hot furnace. Pour into ingots when melted (both the metal and the flux). When cold, the slag is easily broken with a hammer and you have an ingot of clean metal.—W. J. R. Problem 3,302.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

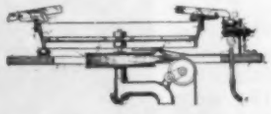
1,478,375. December 25, 1923. **Electric Furnace.** Morris H. Bennett, Waterbury, Conn., assignor to Scovill Manufacturing Company, Waterbury, Conn.



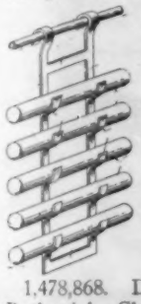
The combination with a furnace for melting metals, of means for delivering a main heating current directly to the charge in the furnace, and means for impressing on said main current a heating current of high frequency, the resulting current producing improved heating effects in the furnace due to the resistance of the charge of said current.

1,478,696. December 25, 1923. **Soldering Machine.** Herman O. Boehme, New York, N. Y.

A machine for automatically soldering articles together, comprising flux applying means adapted to supply flux to the articles, a soldering device for supplying solder to said articles, gripping means for holding the articles in position relatively to each other and conveying means adapted to receive the gripping means and to carry them to the flux and soldering applying means.



1,478,853. December 25, 1923. **Anode and Carrier Therefor.** Harry L. Haas, New York, N. Y.

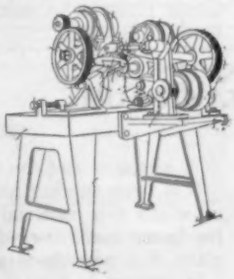


In an anode and carrier therefor for use in the electro deposition of metals, an anode unit consisting of a series of elements of the metal to be deposited, and means to support the anode elements in separated relation and connect the same in circuit with the positive pole of an electric current, said carrier being constructed of a material having the property of being a good electric current conductor and immune from the electrolytic action of the bath.

1,478,868. December 25, 1923. **Soldering Iron.** Anton E. Butkovich, Chicago, Ill.

A soldering iron including a conduit through which a flame is adapted to be directed and having a perforated end portion, a soldering bit at the end of the conduit and provided with an annular recess, and a member surrounding the conduit and having serrated edge portions engaging the recess.

1,479,056. January 1, 1924. **Apparatus for and Method of Cutting Metal.** John T. Cummings, Benjamin H. Daulton, Frank W. Taylor and Clarence J. Robinson, Wilmington, Ohio, assignors to the Irwin Auger Bit Company, Wilmington, Ohio.

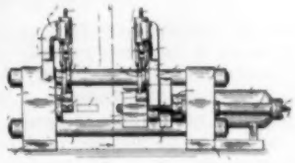


In a machine of the character described, the combination with a bed and bit-securing devices, of cutting units comprising a reciprocating rotary element adapted to travel at an incline across the face of a bit head and to remove the material and finish the face.

1,479,287. January 1, 1924. **Molding Machine.** John W. Dearsley, Racine, Wis.

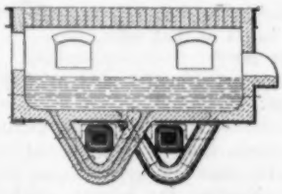
In a molding device, the combination of a drag and a cope having inner and outer members, and a cheek adapted to be positioned between said cope and drag, said cheek having a flange projecting towards the inner members of said cope and drag.

1,479,437. January 1, 1924. **Method of and Means for Extruding Brass and Like Material.** Wm. R. Webster, Bridgeport, Conn.



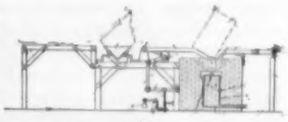
In a metal extruding machine, a frame, a billet container movably mounted thereon, means to limit the movement of the billet container in one direction, said means being capable of being rendered inoperative to permit movement of the container.

1,479,582. January 1, 1924. **Induction Furnace.** Charles A. Brayton, Jr., Cleveland, Ohio, assignor to the Induction Furnace Company, Cleveland, Ohio.



In an induction furnace, the combination of a bath, a closed channel of uniform cross section thereunder and connected therewith and leading to and from the bath, said channel having a comparatively thin wall of substantially even thickness throughout its length and surrounded by a pervious metallic jacket, whereby said wall may be maintained at a relatively cool temperature to prevent permeation of the molten metal through the channel wall.

1,479,783. January 8, 1924. **Soldering Apparatus.** Frank F. Bentley, Warren, Ohio.

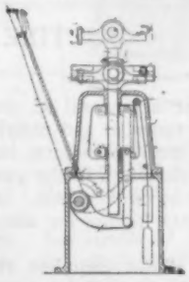


In apparatus of the character described in combination, a flux trough, a solder pot and means for heating the same, parallel ways extending between the flux trough and solder pot to support a can while it is slid from the trough to the pot arranged to guide the can to soldering position over the soldering pot with a joint down, and means under control of the operator for causing a relative movement between the ways and solder pot to bring the same together to dip the can joint into the solder.

1,479,859. January 8, 1924. **Process for Making Antifriction Metal.** William Koehler, Cleveland, Ohio.

The process of producing an anti-friction metal consisting in mixing together finely comminuted metals of different melting points and then subjecting the mixture to a temperature, sufficiently high to melt the metal having the lowest melting point.

1,479,958. January 8, 1924. **Foundry Molding Machine.** Robert Duffus, Lutterworth, England.



Foundry molding machine comprising in combination a pair of rotatable brackets independently mounted on horizontal axes and adapted to receive the pattern plate between them, trunnion heads carrying said brackets, connecting rod and crank mechanism for raising and lowering said heads, laterally projecting lugs on the opposite ends of one of said brackets and a stop pivoted at one side of the adjacent trunnion head and having a limited rotary movement from the horizontal to the vertical.

1,480,846. January 15, 1924. **Aluminum Alloy.** Alfred Von Zeerleder, Neuhausen, Switzerland, assignor to Aluminium-Industrie-Aktiengesellschaft, Neuhausen, Switzerland.

An aluminum-copper-iron alloy consisting of from 88% to 95% aluminum, the remaining 12% to 5% being made up of copper and iron in the relative proportions of two parts of copper to one part of iron, approximately.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

A NEW PLANT FOR ANNEALING WIRE AND STRIP

An entirely new type of plant for annealing non-ferrous wire and strip has been recently placed on the market. This plant is constructed on the Imbery-Alexander patents.

Amongst the features of this machine, the most notable is the method of heating adopted. This heating system consists of the utilization of the electrical resistance of the wire to be annealed, by passing an electric current through the wire and thus heating it to the required temperature. A very complete system of electrical control is provided, enabling a wide range of temperatures, even up to the melting point of platinum, to be obtained. Moreover, it is stated that the exact temperature suitable for the particular gauge and nature of wire under heat treatment can be readily obtained, and maintained at such, day after day, if required, thus ensuring uniform results for every batch of that wire.

Briefly, the operation of the plant is:

The wire, which is placed on the wooden swifts on top of the machine, passes over a fixed contact supported on an insulated bar. From this contact the wire passes through the heating chamber composed of extruded metal sections lined with a special refractory material in order to reduce the heat loss by radiation, etc. After passing through the heating chamber, the wire is guided, by means of a pulley, into the quenching tank, which also serves as a second electric contact. The wire then passes over a suitable wiper to free it from any moisture, and is wound up on a wooden reel, a small insulated pulley, fixed on the guide bar, giving the necessary trahsverse motion to enable the wire to be wound evenly.

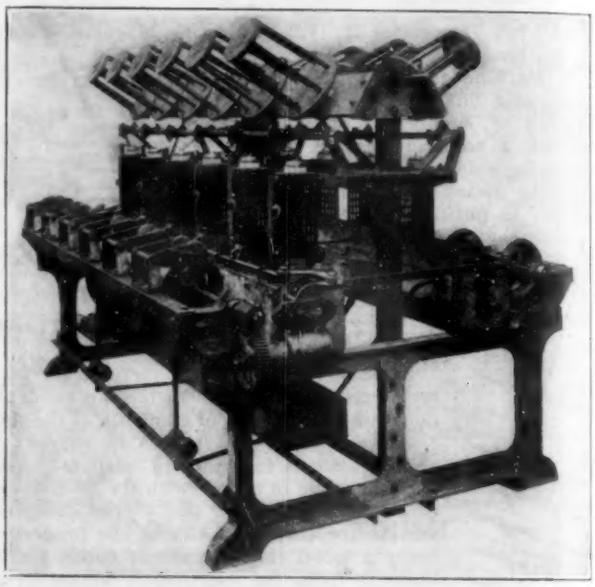
The winding-up reels are driven by means of cast-iron, rubber-faced pulleys, and since the reels are supported on hinged brackets, the increasing diameter of the wire on the reels is automatically taken up and the traveling speed of the wire kept constant. The reel can be readily inserted or withdrawn from the machine by means of a special pin, which is securely locked in position when the machine is in operation.

As the bottom end of the heating chamber is below the level of the water in the quenching tank, the wire is heated in practically an air-tight enclosure, thus oxidization is prevented and the annealed wire is quite free from any scale and discoloration. Each wire is under separate electrical control, and within certain limits various gauges of wire can be annealed simultaneously.

The machine is operated from a compound wound D.C. generator, fitted with inter-poles and specially constructed to give constant voltage irrespective of variation in load. These plants are also constructed for operation from A.C. circuits, the low voltage required being obtained from a special transformer with tappings on the primary side, thus giving a more economic regulation on the secondary.

A control panel complete with voltmeter, ammeter, etc., and shunt regulation for varying the voltage to suit the gauge of wire, is supplied with each machine, thus ensuring a perfect control of the operation. Provision is also made for fitting a recording watt-meter, so that those responsible may have a permanent record of the heat treatment given to every batch of wire that goes through the plant.

The manufacturers of these plants claim for them: (1) That every part of the wire is subjected to identically the same heat treatment, hence absolute uniformity in every batch is obtained; (2) the thermal efficiency of the plant is high and consequently the cost of operation much less than by gas or other combustion method of heating; (3) since the plants are of the vertical type, floor space is conserved and every part of the machine is readily accessible, the operator being able to work easily on either side of the machine; (4) the annealed wire obtained from this plant is perfectly bright, polishing or cleaning, therefore, not being required; (5) the average voltage required is low, about 40, hence it is absolutely fool-proof in operation.



LECFUR WIRE ANNEALING MACHINE

The name "Lecfur" has been chosen as the designation of this new type of annealing plant, and it is under this registered trade-mark that these machines are sold by the manufacturers, The Leeds Electrical Construction Company, Ltd., Charmouth street, Leeds, England.

DUCTILE TANTALUM

The element, tantalum, has classified itself in general as one of the high melting point metals along with tungsten and molybdenum, and like them does not occur as a metal in nature, but always as a chemical compound with other elements, in the case of tantalum, chiefly iron and manganese salts of tantalic acid. Its melting point is 2,770° C., or perhaps slightly higher for absolutely pure material.

Its chief physical characteristics are an almost complete resistance to wet corrosion. It can, for example, be boiled in aqua regia without gain or loss in weight. It is slowly attacked by hydrofluoric acid. Its usefulness as a chemical container, however, is limited by the fact that it combines with oxygen at low red heats, forming a white oxide, and burns entirely to an oxide at higher temperatures. It combines chemically also with hydrogen, nitrogen and the carbon gases when heated in these gases.

It is from an electrical point of view particularly useful in vacuo in which this material has the greatest commercial possibilities. Its linear coefficient of expansion being about the same as lead glass, it is possible to seal it in this material directly.

It appears to have a fairly high electron emission, thus serving as a filament in various types of thermionic tubes. Its electrical resistance being three or four times that of tungsten, a heavier and shorter wire than tungsten wire for a similar purpose is made possible.

Immediate commercial development of tantalum as a battery-charging device is made possible by another characteristic of the material, that of acting as an electrolytic valve. If a sheet of tantalum and a sheet of lead are put in a solution of sulphuric

acid, only one-half of the alternating current wave will pass through the solution, the other half being eliminated. It may thus be used as a source of undirectional pulsating current.

Tantalum was first recognized as a metallic element in 1801, when Hatchett discovered its oxide in a black mineral, which he obtained from the British Museum. The acids of tantalum and the metal, Columbium, a lower melting point metal of the same group as tantalum, were for a great many years confused, and it was not until 1866 that Marignac developed his method of separating their oxide. No pure tantalum metal was made until 1903, when Dr. Von Bolten, of a German company, developed a process for manufacturing tantalum of some purity sufficient to be ductile. The material was not being made in a wholly satisfactory manner, and when tungsten was developed it immediately supplanted tantalum as a filament of incandescent lamps. The material was not available in the United States from 1911 or 1912 until May of 1922, when Dr. C. W. Balke evolved a novel method for its production. It is now being made by the Fansteel Products Company, North Chicago, Ill., who state that the material will always be expensive and limited in its use by that fact.

SPRAY TANK

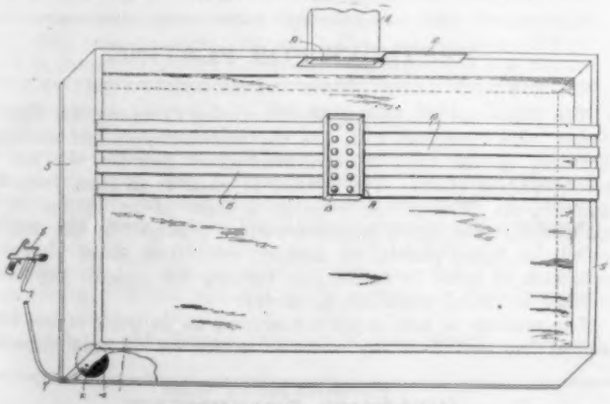
A new invention of E. M. Stephenson, 64 Evergreen Avenue, Hartford, Conn., relates to an improvement in spray tanks. In coating small articles, such as buttons, buckles, clasps, etc., with an enamel or other similar material, the articles are arranged in trays, and the coating is applied by means of a spray gun, but a comparatively large proportion of the coating material does not fall on the articles to be coated, and hence is wasted. The object of this invention is to provide a tank to contain the coating material and over which the articles to be coated are placed, so that the coating material which does not adhere to the articles may fall back into the tank.

A perspective view of a spray tank constructed in accordance with the invention is shown in the drawing. Use a tank (5) of any suitable size and dimensions. In the bottom of the tank is an outlet (6) connected by a tube (7) with a spray gun (8) of any approved construction. Over the outlet (6) is placed a cup-like strainer (9). In one side of the tank, near the upper edge, is an opening (10) to an exhaust pipe (11) through which fumes from the tank may be drawn. Preferably, a door (12) will be provided to close the opening (10). The buttons (13), or other articles to be coated, are placed upon trays (14), and these trays are placed upon a rack (15) adapted to rest upon the upper edge of the tank, which is partly filled with the coating material. The articles to be coated are sprayed in the usual way and all surplus coating material will fall back into the tank, and consequently is saved. The strainer prevents any foreign matter from escaping into the spray gun.

ADVANTAGES OF SPRAY TANK

1. Small work may be placed on the wire mesh, sprayed and then placed on rods on top of spray tank. In using the gun spray, what material does not get on the work will go into the tank and will mix with the solution in the tank. Strain this and it can be used over again. In this way, there is very little material lost.

2. The outlet in the rear of the tank allows the fumes to go through the exhaust fan, preventing any back draught, also preventing dust or fumes to go into the room where spraying is done.



STEPHENSON SPRAY TANK

3. In spraying bronze powders, if water is placed in the tank instead of other solvent, the bronze powder that does not go on the work will form a film over the top of the water, which film can be taken off, put into a can of thinner and dissolved. After straining, it can be mixed very readily with the bronze powder liquid and used over again. Spraying bronze powder over water prevents the powder from flying around the room or accumulating in the hood and dripping down and spoiling other work. This has been tried out in a number of plants and they have found it a great advantage.

4. When it is necessary to change the material in the tank, open the spit cock at the bottom and strain material into a receptacle. This can be corked up and put away. Tank can then be cleaned out with thinner and the thinner allowed to run through a strainer into a receptacle. This thinner can be saved for cleaning out tank again. The heavy pigment may be left in the tank and then scraped up and thrown away.

NEW SPRAY GUN

The De Vilbiss Manufacturing Company, 266 Phillips avenue, Toledo, Ohio, has put out a new spray gun called Type "A." This gun can be used for spraying paint or varnish material on any kind of a surface, thus making itself useful in the finishing room. The following advantages are claimed:

All nozzle parts are self-centering and so designed that the nozzle cannot get out of the alignment; simple design, small number of parts and wearing points (only 1 pivot bearing), no yokes, links, pins or push rods.

DE VILBISS SPRAY GUN

All metal construction.

Body and other parts made of heat-treated aluminum alloy drop forgings; fluid tip of nickel steel; total weight 10¼ ozs.

Revolving air cap producing either a wide fan spray in horizontal or vertical position, or a round, concentrated spray in intermediate position.

Uniform spray under all conditions; no "splitting" or "heavy centering."

Instantaneous trigger control of fluid; no dripping from nozzle.

This spray gun is one unit of the DeVilbiss line of industrial finishing room equipment.

ELECTRIC SOLDER POT

A new electric solder pot with automatic heat control has been added to the line manufactured by J. D. Wallace & Company, Chicago. It greatly simplifies the problem of heating babbitt, white metal, wax and other materials which are slow conductors of heat.

Solder must be kept at a uniform temperature if satisfactory results are to be obtained. When metal is overheated it oxidizes, and this action results in a considerable loss of material and tensile strength. The Wallace Solder Pot is designed to overcome this oxidation. When solder has been heated to 600° F. an automatic control goes into action. This control maintains the temperature of the contents of the pot and prevents overheating and underheating.

This control is an adaptation of the principle used in the steam gauge. A volatile substance, which is very sensitive to heat, actuates a Bourden Tube which makes and breaks the electric current, thus controlling the temperature of the contents of the pot.

The pot will accommodate fifteen pounds of solder and will heat this amount to 600° F. in twenty to twenty-five minutes. This quick action is due to the fact that a 900 watt heating element is built around the entire container. Heat is applied to all parts of the sides and bottom of the container simultaneously, thus coming in contact with the solder at all points, and reducing it to a working consistency.

Once the container is filled and current turned on it requires no attention until refilling is necessary. Workmen may devote their entire time to actual production. There is no necessity in wasting time watching the pot.

The pot weighs only thirteen pounds, can be easily carried anywhere, and operates on either 110-V, or 220-V alternating or direct current. Workmen need not waste steps going back

WALLACE SOLDER POT

and forth between their work and a heater. Full particulars may be had from J. D. Wallace & Co., 1401-17 W. Jackson Boulevard, Chicago, Ill.—H. L. RAMSAY.

NEW FINISH AND RUST PROOFING

The Metal Penetrating Color Corporation, 90 West Broadway, New York, is the owner of the "Jordan Process" of finishing iron and steel parts. This process, it is claimed, puts a beautiful blue-black finish on polished steel and a dull black finish on unpolished steel. In addition to the finish, this process is also said to be an excellent rust preventative.

The process is electro-chemical and consists of five operations. It is claimed that all five operations can be completed in 5 to 10 minutes, depending on article to be treated. The work is handled by unskilled labor, and equipment takes up very little space.

The owners of this process state that under their laboratory tests it has stood up better than the results of any other similar process. The color produced is blue-black on steel, and black on iron. It does not affect temper, change dimensions or affect the solder; can be used on all articles made from iron and steel, such as hardware specialties, tools, precision tools, steel stampings, small machine parts as typewriters, phonographs, adding machines, iron and steel toys, fire-arms, electrical fixture parts. The equipment is sold outright.

HILO CRYSTALLIZING LACQUER

This is a new finish made by the Hilo Varnish Corporation of Brooklyn, N. Y., with a sparkling crystal effect like the surface of crackled glass tumblers. It is claimed that many unusual effects can be obtained with Hilo Crystallizing Clear, applied over different colors. The finish is said to be tough and durable; it withstands handling and outside exposure.

This lacquer is meant for every kind of surface: steel, cast iron, brass, tin, aluminum, die-castings, wood, fibre, plaster, etc. It will adhere to any other finish—amyl-acetate lacquer, enamel, japan, varnish. It is also stated that the crystallizing finish needs less undercoat preparation than is required for flat or gloss finishes. The manufacturers recommend it for fine auto body hardware, auto accessories, instrument boards, clock frames, switch plates, sun visors.

NEW PLATING SUPPLY HOUSE

An electro-plating and polishing supply house is one of Grand Rapids' new business enterprises, and the only one of its kind in western Michigan. This new company, known as the J. C. Miller Company, has opened its office and warehouse at the Weiss Storage, 250-252 Pearl Street. The above company will be managed by J. C. Miller, formerly of the Grand Rapids Metal Products Company. Mr. Miller, having disposed of his interests in the Products Company, will devote his entire time to the sales of electro-plating, buffing apparatus and supplies for all industries. This company will handle the complete line of A. P. Munning & Company of New York and Chicago. Mr. Miller also wishes to announce that he has negotiated with the Belke Manufacturing Company for exclusive sales rights of Michigan on its product.

RECTIFIER FOR PLATING

The American Machine & Manufacturing Company, 441 Folsom Street, San Francisco, Cal., are the manufacturers and exclusive licensees of the Quill Electro-Mechanical Rectifier for use in electro-plating plants. The rectifier is made in all sizes, from 300 amperes up. The power required is from ¼ to ½ h.p. It is claimed that the direct, pulsating current produced by the rectifier results in faster plating, no bubbles, even coat, softer plate and reduction of labor in buffing; no burning for lack of regulating voltage on taking work out suddenly.

The machine is sold under a guarantee to do work in less time and at less cost than any motor-generator set of equal capacity.

WELDING EQUIPMENT

To meet the demand for welding equipment by means of which light gauge sheet metal can be arc welded, the General Electric Company has brought out a current-reducing resistor, the CR-9645-10, to be used in conjunction with their standward WD type welding generators. This resistor will permit the obtaining of currents of from 25 to 75 amperes.

The resistor consists of standard units arranged in a ventilated frame. Parts may be quickly and easily renewed.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

INSTITUTE OF METALS DIVISION

Headquarters, 29 West 39th Street, New York

The New York Meeting will be held from February 18-21, 1923. The program is as follows:

MONDAY, FEBRUARY 18

4 P. M.—Auditorium. Chairman, President E. P. Mathewson.

Annual Lecture of Institute of Metals Division.

The Trend in the Science of Metals. By Zay Jeffries, D. Sc., Director of Research, Aluminum Manufactures, Inc., Cleveland, Ohio.

6 P. M.—Engineers Club.

Dinner, Institute of Metals Division.

8 P. M.—Rooms 1 and 2.

Evening Entertainment and Smoker.

TUESDAY, FEBRUARY 19

2 P. M.—Fifteenth Floor. Chairman, William B. Price. Business Session.

Some Low Copper-nickel Silvers. William B. Price, Chief Chemist and Metallurgist, Scovill Manufacturing Company, Waterbury, Conn., and C. G. Grant, M. S.

Corrosion of Brass as Affected by Grain Size. Robert J. Anderson, Metallurgist, Bureau of Mines, Pittsburgh, Pa., and George M. Enos, Instructor in Metallurgy, University of Cincinnati, Cincinnati, Ohio.

Relation of Heat Treatment, Mechanical Properties, and Microstructure of 60-40 Brass. Robert S. Williams, Associate Professor of Metallography, Massachusetts Institute of Technology. Victor O. Homerberg, Instructor in Metallography, Massachusetts Institute of Technology, and Dexter N. Shaw, Research Dept., Goodyear Tire and Rubber Co., Akron, Ohio.

Effect of Severe Cold Working on Scratch and Brinell Hardness. Henry S. Rawdon, Physicist, Bureau of Standards, Washington, D. C., and Willard H. Mutchler, Laboratory Assistant.

WEDNESDAY, FEBRUARY 20

2 P. M.—Fifteenth floor. Chairman, George K. Elliott.

Round Table Discussion on Fluxes and Deoxidizers.

THURSDAY, FEBRUARY 21

Trip to Bethlehem Steel Works, Bethlehem, Pa.

AMERICAN ELECTRO-PLATERS SOCIETY

NEWARK BRANCH

Headquarters, care of George Reuter, 55 Revere Ave., Hilton, N. J.

The Newark Branch of the A. E. S. held a get-together supper at D. Joannes restaurant, 17 Central avenue, Newark. N. J.

This supper was one of the most successful and well attended suppers ever held at Newark Branch. Supper was served at 7:30 p. m., during which a musical program was rendered by J. Geir, accompanied by P. Wahlen at the piano.

Chas. H. Proctor, founder of the A. E. S., was present and gave a very interesting talk on "Chromium Plating."

Librarian E. W. Faint gave a very interesting description of the Laboratory class research work on plating pure sheet aluminum and then introduced the speaker of the evening, Rev. E. W. Powell, whose subject was "What An Interesting World We Live In."

The Banquet Committee reports that it had settled the date of the next Annual Banquet, which will be held Saturday, April 26, 1924, at Achtel-Stetter's Broad street restaurant. A larger attendance is expected than the one held last year at which 316 persons were served. The old reliable Horace Smith is chairman of the Banquet Committee and has charge of the evening's entertainment, which means that with his past experience this will be the best ever held. Every one should make his reservations early.

The afternoon session will be in charge of Librarian E. W. Faint, G. Erickson and William DeVote. The advertising and publicity end is in very capable hands, those of M. Oliver Sizelove and Peter Kolb. The Ticket Committee is composed of Roy Stout, Philip Sievering and Royal Clark.

The laboratory class is working out something of a very interesting nature and will spring the surprise at the afternoon session.

So watch the old slogan—"Newark Knows How."

NEW YORK BRANCH

Headquarters, care of J. E. Sterling, 468 Grand Ave., Long Island City, N. Y.

The New York branch of the American Electro-Platers' Society started the year off well by having a splendid meeting for the first get-together of the year on Jan. 11, 1924. The business part of the meeting was taken up entirely by the reports from the various committees who are handling the coming banquet on Founders' Day, Feb. 23, 1924. The branch expects to make this one of the best annual affairs and looks forward to having a real educational session in the afternoon with some of the eminent men connected with the plating and chemical industries to address them. A goodly number of visitors throughout the East are bent on getting to the big town for the session.

A very interesting and lively discussion was held on several subjects relating to the silver plating industry in the later part of the meeting. It reminded some of the veterans of the warm discussions they were wont to have in the past days.

NEW YORK BRANCH BANQUET

Call from Charles H. Proctor

The fifteenth annual banquet and educational session of the New York Branch, American Electro-Platers' Society occurs this year on Saturday afternoon and evening, February 23rd, 1924. I am extending a personal invitation to all managers, superintendents, electro-platers, chemists and metallurgists connected with metal manufacturing plants to be present because I am sure it will be worth the time spent.

We are living in an age when commercial industry is constantly increasing its demand for more knowledge in every line of production. By co-operation every man can increase his knowledge, and can in turn, yield to industry the knowledge so gained. Knowledge is gained only through the sacrifice of time. Come to the afternoon session—sacrifice a little time and get your gains in return.

If you can spare a little more time, sacrifice it to the Gods of Pleasure in the evening by attending the banquet. Do not forget to bring your wives, sweethearts and friends.

You cannot afford to miss the fifteenth annual educational session and banquet. Lay your plans now for the time is growing short. Remember the place, the Aldine Club, 200 Fifth Avenue, New York City; the date February 23rd.

You can purchase your admission tickets in advance or make your reservations through C. E. Stiers, 27 Arsdale Terrace, East Orange, N. J. Better do it now while you have ample time. Yes, they will all be there.

ST. LOUIS BRANCH

Headquarters, care of H. H. Williams, 4156 Botanical Avenue

The Eleventh Anniversary on January 19, 1924, was a very successful affair. The afternoon session, which was given over to Dr. Wm. Blum of the Bureau of Standards, was attended by 72 men, including employers, superintendents, foremen and members.

This illustrated talk and the exhibits were concrete evidence of work being accomplished by the Bureau of Standards and also proved the interest our Society takes in this research

work. E. W. Heil of Wichita, Kansas, traveled over 500 miles to come and he said "It was worth more than that." While this session was on the ladies were taken to "Movies" by Mrs. H. H. Williams and Mrs. E. J. Musick.

At 7 p. m. a sumptuous dinner was served and musical program rendered. Then F. Menniges, president of St. Louis Branch, was introduced as toastmaster. Menniges in a few well-chosen words expressed his appreciation for their presence to the 140 guests, as St. Louis was having a blizzard. He then called on Supreme First Vice-President E. J. Musick, who presented an able paper on "Do Employers Realize Value of A. E. S." Dr. Wm. Blum then demonstrated his ability as an after-dinner speaker, proving that research work could be presented and advocated even in a mixed audience. St. Louis Branch was proud to have Dr. Blum on the program. "You Can Never Tell" was the subject given to H. J. Richards, our Past Editor. Every one who knows Hedley realizes "You Can Never Tell" what he will spring, and to say he lived up to past reputation is putting it mildly.

E. W. Heil tried to "side step" as his name had not been printed on program. It would have been in letters of gold had we known he was coming. E. Lamoureux of Chicago Branch, who was instrumental in starting St. Louis Branch, said some nice things, and was followed by F. J. Liscomb of same branch, who presided while our branch was being organized. After a few closing remarks by H. H. Williams the rest of the evening was given over to dancing.

E. J. Musick was chairman of committee in charge of this successful affair, and G. S. Robins presided at afternoon session. Mr. Robins also gave several readings in the evening.

TESTING MATERIALS SOCIETY

Headquarters, 1315 Spruce Street, Philadelphia, Pa.

The progress of the society during the past year in the field of Non-Ferrous Metals is represented for the most part by the work of the several standing committees covering this field. These are the standing Committees on Copper Wire, on Non-Ferrous Metals and Alloys, on Corrosion of Non-Ferrous Metals and Alloys, on Screen Wire and on Metallography.

The Committee on Copper Wire submitted three new Tentative Standards at the last annual meeting. These are the Tentative Specifications for Round and Grooved Hard Drawn Copper Trolley Wire, which include the portion of the Standard Specifications for Copper Wire dealing with trolley wire, the Tentative Specifications for Soft Rectangular Copper Trolley Wire and the Tentative Specifications for Hot Rolled Copper Rods for Wire Drawing.

The Committee on Non-Ferrous Metals and Alloys is investigating the subject of standard test bars for tension and compression tests of cast non-ferrous metals. Eleven manufacturers of cast materials including the U. S. Bureau of Standards have signified their willingness to make a series of comparative tests on a test bar, the requirements for which have been specified. The last report of the committee constitutes a report of progress on this subject. Included with its report at the last annual meeting was a paper entitled "A Review of the Tin Situation" prepared by Lawrence Addicks. This paper clearly sets forth the status of the tin market and itemizes several sources of tin, the approximate production of each source and the characteristics of the tin coming from the various localities in which it is mined in any quantity.

The Committee on Screen Wire Cloth submitted as its first specification a specification for non-ferrous insect screen cloth. This specification includes cloth made from copper wire and from an alloy consisting of 90 per cent copper and 10 per cent zinc.

The Committee on Metallography has prepared Tentative Methods of Metallographic Testing of Non-Ferrous Metals and Alloys. This represents quite a bit of progress toward arriving at standard methods of testing metallographically.

A most interesting Symposium is promised for the next annual meeting of the Society to be held during the last week in June, 1924. This Symposium will deal with the corrosion resistant, heat resistant and electrical resistant alloys. It is planned to have papers presented dealing with the various phases of these several alloys. For example, the corrosion resistant alloys will be covered from the atmospheric, chemical, sea water and mine water point of view. The heat resistant alloys will be considered in view of their behavior at low and high temperatures. It is planned to issue a preprint pamphlet containing all the formal papers to be presented and to solicit written discussion and invite oral discussion at the meeting.

Another promising topic for consideration this year is "The Effect of Temperature Upon the Properties of Metals." Plans are under way for a discussion of this subject at a Joint Meeting of the American Society of Mechanical Engineers and the American Society for Testing Materials.

AMERICAN ELECTROCHEMICAL SOCIETY

Headquarters, Columbia University, New York City

The American Electrochemical Society has had a very active year. The spring meeting was held at New York. The main attraction at this meeting was the session devoted to the production and application of the rarer metals. It was a splendid opportunity to bring to the attention of the membership at large the commercial importance of such metals as molybdenum, zirconium, and germanium. Another session of the New York meeting was devoted to electrode potentials and particular emphasis was placed upon the influence of the base metal on the structure of electrodeposits. This subject is rapidly gaining in importance, particularly among electroplaters, and various laboratories are now occupied in carrying out investigations along these lines.

The fall meeting of the society was held at Dayton, Ohio. Just at the electrochemist looks upon the automobile industry of Detroit as being largely dependent upon the electrochemical industry, so likewise does the electrochemist look upon the rapid development of the aeroplane as due in large measure to the electrochemical industry. At Dayton the electrochemist had an opportunity to inspect the latest type of aeroplane, constructed almost entirely of the light magnesium aluminum alloy. Both magnesium and aluminum are made electrochemically. The main session at the Dayton meeting was devoted to the Electrochemistry of Gaseous Conduction. This was a rare opportunity afforded the members to become acquainted with the many important advances made in the allied field of physics within the past ten years. The contributions to the session were from the research laboratories not only in America, but in England, France, Holland, Germany and other countries. It was a successful meeting.

An innovation at the Dayton meeting, for which President A. T. Hinckley is largely responsible, was the holding of informal round table discussions. There were four of these tables; one of them was devoted to electric furnace brass foundry practice, another was devoted to electrodeposition, a third to organic electrochemistry, and the fourth to the utilization of chlorine. Those attending felt free to discuss problems which had come up in their plant experience without fear of being reported in print. These informal discussions have been so popular that it has been planned to hold similar discussions at the meetings in 1924.

The coming spring meeting will be held at Philadelphia, April 24, 25 and 26, 1924, with headquarters at the Bellevue-Stratford. The main technical session will be devoted to electrodeposition, and Stanislaus Skowronski will preside at this session. There will be tungsten, and others. There will also be a round table discussion on electrodeposition and one on electric furnace refractories. The latter will be presided over by M. L. Hartmann, of the Carborundum Co., Niagara Falls, N. Y.

papers on the electrodeposition of copper, nickel, zinc, chromium,

NATIONAL RESEARCH COUNCIL

Headquarters, Washington, D. C.

The National Research Council has issued two booklets. One, Organization and Members, is a list of divisions, their personnel and others in any way connected with the Council. The other is a Statement of Activities for the year July 1, 1922-June 30, 1923, compiled by Vernon Kellogg, Permanent Secretary of the Council.

BRITISH INSTITUTE OF METALS

36, Victoria Street, London, S. W. 1, England

The Annual General Meeting of the Institute will be held at the Institution of Mechanical Engineers, Storey's Gate, Westminster, S.W. 1, on Wednesday and Thursday, March 12 and 13, commencing each day at 10.30 a.m. The Presidential Address will be delivered by Professor T. Turner, M. Sc., A. R. S. M., in the morning of March 12th. Fourteen Communications are due for presentation at the meeting.

For the first time in the Institute's history the membership has passed the figure of 1,500 but at least 2,000 members are needed if sufficient financial resources are to be available to enable the work of the Institute to be enlarged—or even continued—in the manner desired by the Council.

ASSOCIATION OF BRASS MANUFACTURERS

Headquarters, City Hall Square Building, Chicago, Ill.

The association has been called upon by the Government to assist in the revising of their plumbing specifications covering the Navy, Army and other public buildings, whereby a specification could be drawn and adopted that would allow of competition by all manufacturers instead of its being limited to specialties of one manufacturer.

In addition to this work, the revising and bringing up to date a revised catalogue to be published in 1925, has called for the efforts of three committees, two of which are permanent and active, these being the Standardization and the Elimination Committees.

The Elimination Committee, which functions with the Standardization Committee, recommends to the association the elimination of those goods and patterns of antiquated design and purpose which have been supplanted by more improved and up to date appliances.

At five-year intervals these two committees work in conjunction with the Catalogue Committee, which furnishes an up to date catalogue covering as near as we can all plumbing appliances made of brass.

These two former committees also work in harmony with other associations such as the potters and enamelware people, in an effort to arrive at standards, whereby they effect the assemblage of one class of product with another. This work will, of course, be continued among this year's activities.

The association, represented by its Standardization Committee, is now undertaking with the United States Bureau of Standards, a series of experiments for the purpose of having corrosion tests made on various materials.

Additional activities of the association are co-operation with the United States Chamber of Commerce, the Trade Extension Bureau, the United States Bureau of Standards and the various Supply Associations interested in plumbing and sanitation.

Last, but not least, is the educational effort analyzing the problems that are brought up as to the proper care and use of plumbing goods. To illustrate, finding out under what conditions nickel plated goods discolor, how to prevent it and how to remove it, and getting such information before the public.

WASTE MATERIAL DEALERS

Headquarters, Times Building, New York

RATES ON BRASS ASHES

The Central Freight Association, under its proposal 7559, proposes the establishment of rates on brass ashes on the basis of 85% of sixth class, minimum weight 30,000 lbs. At the present time the rates are provided on the billet basis in Item 1240-A of C.F.A. Exceptions to the Classification and where no billet rates are in effect the scrap iron rates apply. Those shipping brass ashes between C. F. A. points should advise us immediately of the points to and from which they are shipping with a memorandum of the rates assessed on such shipments.

DROSS OR SKIMMING RATES

The Southern Freight Association has docketed for consideration on December 4th, a proposal to establish a rate of 29½c. in lieu of the present sixth class rate of 76½c on dross or skimmings, babbit metal, lead and zinc, etc., minimum weight 40,000 lbs. from Charleston, S. C., to Memphis, Tenn. It is claimed that the proposed rates are in line with other rates in Southeastern Territory.

ANTIMONY CASE DISMISSED

The Commisison has dismissed No. 13543, Winter and Ross vs. Great Northern, et al., 83 I. C. C. 331, holding that the rate of $1.33½ charged on two cars of refined antimony shipped from Seattle to Chicago in October, 1920, was not unreasonable. The claimants contended for a rate of $1.00, which was applicable on tin, on account of the difference in value of the two commodities, but the Commission stated that it had not been shown that there was any competition between the two commodities.

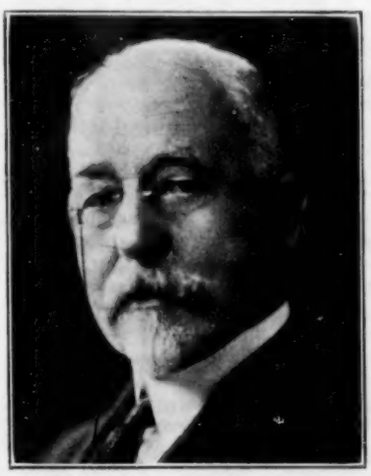
Personals

C. G. BACKUS

C. G. Backus of A. P. Munning & Company, New York, is one of the pioneers in the business of manufacturing electro-plating supplies and equipment. He is known wherever there are plating plants and is liked and respected by his customers, associates and competitors.

He was born in Brandon, Vermont, and lived there until 1870 when he moved to Montague, Mass., and there graduated from the Grammar and High Schools of that town. During vacation time he was employed at the factory of the Millers Falls Company (at Millers Falls in Montague township). At the Montague High School the Chemical Laboratory was unusually good and interested him greatly. It so happened that during his vacation work, he was assigned to work in the new plating department just established at the plant of the Millers Falls Company, and this gave him a chance to apply, in a practical way, some of the chemical work done in the high school. This work enabled him to understand quickly the basic principles relating to electro-plating which were then very little known.

This plating department when first installed was one of the first of its kind in New England. At this time there were no generators known that were practical, and the plating was done by the use of batteries made of zinc plates, sulphuric acid and porous cups containing carbon plates with nitric acid. His first duty in this department was the daily care of these cells. A year or two later these batteries were replaced by a small generator, water cooled, made by Weston, which reversed its polarity several times each day.



C. G. BACKUS.

During his last year in the high school and immediately afterward, he went to work in the Silver Plating Department just established at the Russel Cutlery Company, Turners Falls, Mass., where the work done was silver plating on table ware (knives, forks and spoons). It was about this time that he obtained his first position as foreman plater in charge of the plating and polishing at a small factory at Winchendon, Mass. In 1880 he took charge of the plating department at the Florence Sewing Machine Company, Northampton, Mass., and remained there until 1883 when he took a similar position with the American Sewing Machine Co., Philadelphia, Pa.

Having become known for his interest in the subject of

coloring and finishing of metals and objects of art, a few years later, he was offered the position as superintendent of the factory of the Thackeray Manufacturing Company where they made electric and gas fixtures and art metal work. For a number of years he remained in this line of industry and was superintendent of the factory of the deKosenko and Hetherington Manufacturing Company and also the Ledig Manufacturing Company, both of Philadelphia.

A fire destroyed the plant of the Ledig Company and they went out of business. He then accepted the position as representative of the Zucker, Levett & Loeb Company for Pennsylvania and New Jersey. This Company, at that time, being one of the oldest and best known houses in this line. A few years later he was called to New York to take charge of their factory and remained there until they went out of business after the death of their president, Charles Loeb.

During the summer of 1914 Mr. Backus took charge of the New York Office of the Munning-Loeb Company (afterwards changed to A. P. Munning & Company) and is still working with them in that capacity.

E. T. Williams has joined the present force at the Cleveland district office of the W. W. Sly Manufacturing Company.

H. P. Furlong has been made assistant to D. P. Carter in the New York office of the W. W. Sly Manufacturing Company.

Ralph O. Mullen has been appointed assistant to C. P. Guion, who is the Chicago representative of the W. W. Sly Manufacturing Company, Cleveland, Ohio.

H. W. Dunbar has sailed for Cuba where he expects to stay for a short time. He is assistant to the sales manager of the Norton Company, Worcester, Mass.

H. R. Atwater is the Pacific Coast representative of the W. W. Sly Manufacturing Company. He was formerly sales manager of the Osborn Company, Cleveland. Mr. Atwater is located at 1407 Detroit Street, Hollywood, Calif.

Philip L. Smith, formerly with Naylor & Company, Inc., continuously for twenty years, recently relinquished his interests in William H. Mills & Company, Inc., to assume the management of the Ore & Metal Department of H. Hollesen, Inc., Importers & Exporters, New York.

H. P. Parrock has opened an office at 131 State Street, Boston, Mass., and will engage in private practice as engineer, specializing in foundry and machine shop practice in iron, steel or brass and collateral work. Mr. Parrock was with the Lumen Bearing Company, Buffalo, for several years, and more recently with the Draper Corporation, Hopedale, Mass.

Dr. Richard Moldenke, who recently returned from a trip abroad, discussed European conditions at a meeting of the Newark Foundrymen's Association, at the Down Town Club, Newark, N. J., on the evening of January 9. Dr. Moldenke described the experiences of the group of American Foundrymen who went to the International Paris Foundrymen's meeting and exhibition. Incidentally, he also described the meeting of the German Foundrymen's Association at Hamburg, Germany.

Prof. Elihu Thomson, one of the founders of the General Electric Company, and among the world's most eminent electrical engineers, has been awarded the Lord Kelvin gold medal and will go to England during the coming summer to receive it July 11, 1924. The award was made by British and American Engineering Societies acting jointly. It is awarded every three years as a mark of distinction and for excellence in original research work in engineering. Prof. Thomson is the first American to receive this honor. Prof. Thomson has been granted about seven hundred patents in the United States. His inventions in dynamo electric machinery, electric welding, watt-hour meters, lightning arresters and magnetic arc extinguishers are fundamental. He was a pioneer in arc lighting and innumerable electrical devices have been improved through his work.

Frederick M. Becket, chief metallurgist of the Electro Metallurgical Company, and vice-president of the Union Carbide and Carbon Research Laboratories, Inc. (both subsidiaries of the Union Carbide and Carbon Corporation), was awarded the Perkin Medal of the Society of Chemical Industry, on January 11, 1924, for his achievements in the field of applied chemistry. Mr. Becket has spent a lifetime in working with electric furnace products, principally ferro-alloys. While he has been closely associated with the entire ferro-alloy industry, his influence has been especially marked in his discoveries and developments in the reduction of molybdenum and vanadium with silicon metal, the perfection of low-carbon ferro-chromium, chromium metal, and many heat-resisting alloys of iron and chromium, and quite recently the perfection of manufacturing processes and the technique of using the new alloy ferro-zirconium.

In addition to these many activities, Mr. Becket has been greatly interested in metallurgical problems connected with welding and cutting by the oxy-acetylene flame, and is directing noteworthy investigations along these lines.

Deaths

HARRY R. RILEY

Harry R. Riley, died November 21, 1923, at his home in Brooklyn, N. Y. He was a member of John J. Riley & Company, gray iron and brass founders, Brooklyn.

WILLIAM HOOPES

William Hoopes, aged 57, head of the research and technical departments of the Aluminum Company of America, Pittsburgh, Pa., died January 10, 1924, in his home in the D'Arlington apartments, Neville street, Pittsburgh.

The introduction of aluminum for electrical purposes, particularly for high voltage transmission, is credited to the efforts of Mr. Hoopes. He placed in successful operation many metallurgical operations which caused him to be recognized everywhere as an authority in aluminum metallurgy.

He was born in West Chester, Pa., and was educated in the public schools of West Chester and Philadelphia. Later he was graduated from the school of engineering at Lehigh University. For 10 years after he left the university he was engaged in the construction of electric railways. He then came to Pittsburgh and joined the staff of the Westinghouse Electric & Manufacturing Company. He became chief electrical engineer of the Aluminum Company in 1900, and had been head of the technical departments for seven years.

He leaves his widow and a daughter, Mrs. F. Crossman Fitler of Pittsburgh.

FREDERICK LINES

Frederick Lines died at his home on January 16 at the age of 57. He came to the United States when he was 19 years old as a private secretary, having been born in Birmingham, England. He later went to the Scovill Manufacturing Company of Waterbury, Conn., as secretary and remained there more than 10 years, after some years in New York. Mr. Lines was treasurer of the Matthews Manufacturing Company, Worcester, Mass., manufacturer of metal stampings, at the time of his death, having become associated with the company 15 years ago as executive head of the business.

HOMER BOOTH BELFIELD

Homer Booth Belfield, purchasing agent for the Billings & Spencer Company, Hartford, Conn., died at the Hartford Hospital, January 14th, following operations for appendicitis and peritonitis.

Mr. Belfield was born in Southbury, November 8, 1866, son of Stiles Belfield and Susan Booth Belfield. He was a member of the Purchasing Agents' Association of Hartford and its president in 1920 and had been in the employ of Billings & Spencer Company for twenty-eight years.

Mr. Belfield was a widower, his wife having died January 20, 1923. He leaves his mother, Mrs. Susan B. Belfield of Springfield, Mass., and a cousin Fred N. Booth of West Hartford.

FRANCIS J. NAPOLITAN

Francis J. Napolitan died in East Orange, N. J., January 6, 1924, having gone there for radium treatment following an operation for cancer in Springfield hospital, Springfield, Mass. After graduating from the Technical High School, in Springfield, Mass., with honor, Mr. Napolitan became associated with the Cave Welding Company. He went with Mr. Cave to the Davis-Bourneville Company of Jersey City, since taken over by the Air Reduction Sales Corporation, as head chemist and designer of welding equipment. He developed the "Napolitan Flux" for sheet aluminum welding for automobile body work.

GEORGE KRODER

George Kroder, one of the owners of a brass foundry at 95 Monitor street, Brooklyn, N. Y., was instantly killed when the automobile which he was driving was struck by a locomotive on the Long Island Railroad at the gates of Calvary Cemetery in Queens, January 20. Mr. Kroder's wife was also killed, and five others were badly injured. The scene of the accident was the Penny Bridge, which connects the Blissville section of Long Island City with the Greenpoint section of Brooklyn. The bridge crosses the railroad tracks and also Newtown Creek, along which the tracks run.

NEWS OF THE INDUSTRY

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS

NEW ENGLAND STATES

WATERBURY, CONN.

February 4, 1924.

A puzzling case as to who owns the land on State street recently bought by the **American Brass Company** has been settled by a decision by Judge Nickerson of the Superior Court in favor of **Winford E. Hotchkiss,** on the ground that Hotchkiss's former partner, Harry Dakin, had no right to sell the property to the Brass company.

The last step in the big merger of the **Scovill Manufacturing Company** with the **Oakville Company** and the **American Pin Company** was taken this month, when E. O. Goss, president, and Leavenworth R. Sperry, secretary of the Scovill Company, filed notice with the secretary of state in Hartford of the increase of its capital stock by an issue of 27,000 shares of the par value of $100, making the total shares of the company now 177,000 and the total amount of capital stock, $17,700,000. The increase is for the purpose of buying the properties, assets, etc., of the two pin companies.

The **Waterbury Buckle Company** has issued 4,000 shares of its stock in the form of stock dividends making the outstanding capital of that concern $800,000. Notice of the increase has been filed in the office of the secretary of state.

At the annual meeting of the stockholders of the **Lea Manufacturing Company,** the following directors were elected: John Leather, chairman; Robert Leather, Francis Carroll, Michael Burns and Louis Bria. The directors met and elected the following officers: Robert Leather, president; Frank Carroll, treasurer; Michael Burns, secretary.

At the annual meeting of the stockholders of the **Electrical Appliance Company** the following were elected directors: Frank E. Merrick, Fred J. Merrick, A. Henry Weisman, Henry J. Kast and Harry E. Faber. The directors met and elected Frank Merrick president of the company, and Fred Merrick, secretary and treasurer.

John E. Liggett, formerly of the bond brokerage firm of **Liggett and Drexel of New York,** who bought the late **M. E. Keeley's** brass factory in Mixville and the Pilling factory on Watertown avenue here and consolidated both in the name of the **Connecticut Brass Company,** has filed a petition in bankruptcy in Chicago. He is indebted to the Merchants Trust Company of this city to the extent of $50,000 on a note. He secured this loan after he had purchased and combined the two local factories.

The Scovill Manufacturing Company has engaged Miss **Millicent Pond** to apply psychological tests in the company's employment office. Miss Pond is now taking a post graduate course in psychology at Yale and her work at Scovill's is part of her Yale work. She was engaged by the Winchester Repeating Arms at New Haven in the capacity of psychologist for three years. The applied tests which she will give at Scovill's are purely experimental and the methods have not as yet been adopted as part of the employment system here. If they prove to be valuable in the employment of persons for the plant, it is expected that they will be adopted.

The inventory of the late **James S. Elton,** director in the American Brass Company, former head of the Waterbury Brass Company and leader in a number of local brass industries, has been filed and shows an estate of $1,292,061.25. His son, John P. Elton, a director in the American Brass Company, is the sole heir at law. His real estate holdings totaled $137,500; stocks, $754,309; bonds, $361,238; mortgages, $2,512; cash, $21,391, and miscellaneous, $14,910. Some of his most important stocks were Blake & Johnson's $84,150, Scovill Manufacturing Company $148,200, American Hardware Corporation $92,531, Waterbury National Bank $22,800, Waterbury Farrel Foundry $24,000, Landers, Frary and Clark $123,187. No item appears for stock in the Anaconda Copper Mining Company which was exchanged in part for the American Brass Company stock, so it is apparent that he disposed of his holdings in the Brass company stock when the merger took place.

On January 18th, the **Bristol Company** celebrated the new addition to its plant by an entertainment and dance for the employees. The addition consists of two new buildings which will be devoted to the manufacture of patented Bristol radio sets.—W. R. B.

BRIDGEPORT, CONN.

February 4, 1924.

The **Bridgeport Brass Company** is remodelling two of its six-story buildings which have been out of use for some time, in preparation for an extended manufacture of plumbing supplies. It has been making certain lines of plumbing supplies for some time but is contemplating their manufacture on an enlarged scale and as soon as the remodeling is complete it will begin the manufacture of more varieties of plumbing supplies and on a greater scale.

The former plant of the **Liberty Ordnance Company** in Union avenue, recently traded by Kenneth McNeil for the Park Row building in New York, is to be sold through the factory department of the Joseph P. Day, Inc. The machine shop building has already been sold to the Belknap Manufacturing Company.

Decision has been given in favor of the **National Cash Register Company** in its action against the **Remington Arms, Inc.,** of this city, over certain patents acquired by the defendant, by Justice Proskauer of the Supreme Court of New York. The court ruled that the patents were the property of the National Cash Register Company.

Vice-President **L. S. Betts** of the Remington company, declared following the verdict, that the company would continue the manufacture of cash registers as the decision did not affect them. "The decision referred to is partly favorable and partly unfavorable to the Remington company," he stated. "The matters decided against this company are regarded of no great importance. We will, of course, appeal these to the Appellate Division of the same court and later to the State Court of Appeals, if necessary. Our attorneys advise us that

the unfavorable decisions will probably be reversed on appeal. The decision as rendered will not interfere with the manufacture and sale of Remington cash registers or our plans for rapid expansion of this business."

A stockholders' protective committee is proposed in a circular sent to holders of **International Silver Company** shares, and signed by Raymond D. McGrath of Lizard Freres; Sydney C. Borg of New York and Arthur C. Lehmann of Lehmann Brothers, New York. The Holmes and Edwards' plant here is a division of the silver corporation. As a result of the stockholders' protest the company has withdrawn the circular it issued offering $600,000 common stock at $50 to holders of the common and preferred.

By announcement of President **Gerard Swope**, employees of the **General Electric Company**, who on March 1 will have been in the service of the company for six months or more are to have a new opportunity to subscribe to the eight per cent. bonds of the Employees' Securities Corporation. At the present time over 25,000 employees of the company are holders of these bonds, or will become holders upon completion of installment payments.

Walter L. Oswald, general manager of the New England branches of the **Crane Company**, spoke at the monthly meeting of Bridgeport branch of the National Association of Stationary Engineers, through the officials of the Crane Company of this city. He lectured on "Steam Specialties," and his lecture was illustrated with moving pictures.

William Walter Jones of 316 Colorado avenue, Bridgeport, for a long time superintendent of the **Bryant Electric Company**, died at his home in Bridgeport, January 17, after a short illness. He was born in Utica, N. Y., November 18, 1849, but has resided in Bridgeport for the past 50 years. He was connected with the Bryant Electric Company for about 40 years, during a large portion of which time he served as superintendent. He leaves, besides his wife, one daughter, Jessie Jones Johnson, widow of Harry DeForrest Johnson, and two sons, Dr. Walter E. Jones of Middletown and Robert M. Jones, former assistant city clerk.

President **Stanley Bullard** of the Connecticut Chamber of Commerce, says of industrial conditions in Bridgeport: "Present conditions are a great deal better than during the first part of 1923. There has been a five per cent. increase in employment. Bank clearings and postal receipts have shown an increase over 1922. Mercantile business has been exceptionally good. Business men and manufacturers look forward to a fairly good business year in 1924."—W. R. B.

NEW BRITAIN, CONN.

February 4, 1924.

Generally, business conditions among the metal manufacturing concerns of New Britain are very good and in many cases excellent. Indications point to a continuation of good business during the winter months and there is no reason to fear, those at the top state, of any appreciable decline in the spring. On the other hand, there is every likelihood of continued or even increased business for, with a national housing shortage to be overcome, building must boom and with that comes a demand for New Britain made products.

The **American Hardware Corporation** in its several branches is putting out practically a maximum production of goods. **Landers, Frary & Clark** with an ever-increasing number of articles of both electrical and cutlery types for household use keeps well in the front of the progressive and busy concerns.

In the neighboring city of Bristol conditions are not quite so good insofar as the **Bristol Brass Company** is concerned. This concern, one of the oldest brass mills in the country, has been operating on an actual loss for a long time. Now it faces an internal warfare which is aimed directly at the president, **Albert F. Rockwell**. A group of common and preferred stockholders is making a strong effort to line up enough opposition at the February meeting to oust Mr. Rockwell as president. Their contention is that the high overhead at the plant is not justified by the business results. More business must be obtained in order to make the concern a paying proposition, they claim. Mr. Rockwell on the other hand is defiant. He insists that the concern will ultimately get back onto its feet and that at the present time all humanly possible to accomplish this end is being done. —H. R. J.

TORRINGTON, CONN.

February 4, 1924.

A big addition is being built to the plant of the **Fitzgerald Manufacturing Company.** The addition is to be 200 feet long, two stories high, of fireproof mill construction, and will be used to take care of expansion in the electrical motor and gasket departments.

In the new city grand list, just completed, Torrington's 33 manufacturing plants are listed at $5,657,129, and the stock of manufacturers and merchants at $3,289,797, as against $5,327,729 and $3,108,774, respectively, in last year's list. The total grand list this year is $27,502,930, a gain of nearly a million and a quarter over the total taxable property here last year.

David H. Stewart, for 15 years engaged in the office of the **Coe Brass** plant here and more recently at the American Brass office in Waterbury, died suddenly at his home in Torrington on January 24, at the age of 38.

The three-story frame factory building in Winsted, occupied by the **Universal Bronze Bearing Company** was destroyed by fire on January 11. Firemen fought the blaze for five hours. The cause was not ascertained. The loss was close to $30,000 and about 25 hands were thrown out of work.

Valuations of Torrington plants for taxation purposes are listed as follows: American Brass Company, $3,895,600; Standard plant of Torrington Company, $1,035,223; Fitzgerald Manufacturing Company, $100,645; Hendey Machine Company, $985,302; Hotchkiss Brothers Company, $289,306; Progressive Manufacturing Company, $251,864; Torrington Manufacturing Company, $255,080; Excelsior plant, Torrington Company, $790,720; Turner & Seymour Manufacturing Company, $369,118; Union Hardware Company, $896,399; Warrenton Woolen Company, $358,400.—J. H. T.

PROVIDENCE, R. I.

February 4, 1924.

Business in practically every line of the metal trades during the month of January gave evidences of continuing the general good conditions that marked the closing months of 1923, with prospects bright for an indefinite activity. While none of the branches of the metal trades are expected to experience a boom or a banner year, all are looking forward to one of normalcy, at least.

Following a hearing before Presiding Justice Tanner in the Superior Court for Providence County upon the petition in equity of Irving F. Orr, a decree has been entered dissolving the **Clauson Architectural Metal Works** as a corporation.

Lawrence Parker has resigned his position with **Duncan Greenhaldge**, North Attleboro refiner, and will engage in business for himself. He has leased the **C. E. W. Sherman** plant on Elm street, North Attleboro, which has been used for refining purposes since 1842.

The annual banquet of the **Providence-Attleboro Branch** of the **American Electro-Platers' Association**, which has usually been held in January, has been temporarily passed this year, although it may be held later in the season.

One of the finest examples of the handicraft work of an Attleboro craftsman is to be sent out of that city within a short time in the form of a beautiful Celtic communion chalice to be presented to a Massachusetts clergyman whose son will observe his 25th anniversary as a clergyman. The chalice is of gold and silver inlaid with diamonds and is valued at more than $5,000. The chalice represents about two months of steady work, all done by hand and will constitute an excellent piece of advertising for the city of Attleboro. It was designed by **John Gabriel Hardy** of Warwick, R. I.

At the recent annual meeting of the **New England Manufacturing Jewelers and Silversmiths' Association** the following directors were re-elected: Everett L. Spencer of the E. L. Spencer Company, Providence; Alfred K. Potter of the Gorham Manufacturing Company, Providence; Frederick D. Carr of the Ostby & Barton Company, Providence; Ellis W. MacAllister of the Irons & Russell Company, Providence; Gustave W. Stranberg of Sykes & Strandberg of Attleboro;

George L. Shepardson of C. A. Smith & Co., Attleboro; Theron S. Curtis of the T. I. Smith Company, North Attleboro; Frederick A. Ballou, Jr., of B. A. Ballou & Co., Inc., Providence, was elected to succeed Frederick A. Ballou, Sr., of the same concern. In the president's annual report he asserted that the general business conditions indicate a greater volume of business for the coming year and the report of the secretary-treasurer showed a net increase in membership of 31 with a corresponding increase in the work of the office. At the subsequent meeting of the directors Henry Wolcott of the Wolcott Manufacturing Company, Providence, was re-elected president, and Horace M. Peck, secretary-treasurer. The other officers are: First vice-president, Ellis W. MacAllister; second vice-president, Gustave W. Strandberg.

Jobbers' **Curtain Rod Manufacturing Company, Inc.**, of Providence, which will engage in a general manufacturing business, has been granted a charter under the laws of Rhode Island. The capital is 500 shares of stock without par value. The incorporators are George W. Bugbee and Frank T. Downing of Providence and Lerow E. Brown of Riverside.

Augustus L. Leavitt, for the past 30 years proprietor of an enamelling business at Attleboro, died last month after a protracted illness. He was 64 years old, having been born in Canton, Mass., August 11, 1859. He is survived by his widow and four sons.

L. & B. Jewelry Manufacturing Company of Providence has obtained a charter from the Secretary of State, under the laws of Rhode Island, with an authorized capital of $5,000 for the purpose of manufacturing jewelry and be located in this city. The incorporators are Daniel J. Leary and Thomas F. Farrell of Providence and Sidney J. Betherman of Cranston.—W. H. M.

MIDDLE ATLANTIC STATES

ROCHESTER, N. Y.

February 4, 1924.

The first month of the new year is practically ended, and a review of business conditions in the local industrial field warrants the belief that real improvement is in store. More activity is observed since the holiday season, and the fact that wider employment is to be had increased the belief that normal prosperity will have been regained by spring.

Manufacturers employing metals declare that the usual depression of presidential years is not to prevail in Rochester this year, as prospects for future business are much brighter than in the past fourteen months. In fact certain plants that have been operating regularly during the past year, but buying their metal supplies on a sort of hand-to-mouth basis, are planning to go ahead as in flush years agone. Buying of metals has been increasing since the middle of the month, and at the monthly session of the Purchasing Agents' Association it was announced that the value of orders placed for materials for February and March delivery was twice the aggregate of any month since last June.

There is great activity at the plant of the **General Railway Signal Company,** owing to the fact that much railway signal equipment has been ordered by Western and Central-Western railroads of late. It is said that the Signal company expects a large order from Japan, recently. Increased production is reported from the **Eastman Kodak** plants and the **Bausch & Lomb** optical works.

Increased building operations in Rochester are providing local brass foundries with additional business. Reports from the brass foundries indicate that a sharp improvement in trade is being experienced. The silver-plating industry here is rather quiet just now.—G. B. E.

TRENTON, N. J.

February 4, 1924.

Two concerns to deal in metals and zinc were recently incorporated at Trenton. The **United States Zinc Products Company,** with offices at 709 Hamilton avenue, Trenton, chartered with $125,000 capital, divided into $100 shares, of which $80,000 is preferred stock and the balance common shares. The company will act as wholesale and retail agents for zinc products. The incorporators are Robert H. Engle, Eberhard Vollmer, Jr., and Alan L. Engle.

The **Capitol Surplus Corporation,** of Trenton, was incorporated by Counsellors Katzenbach & Hunt. The company has 2,000 shares of stock at no par value and will deal in various kinds of metals.

Aluminum Die Casting Corporation of Germany has been incorporated at Trenton with $250,000 capital to manufacture articles made of aluminum.

Walter F. Young Company, Inc., of Bloomfield, N. J., has been incorporated at Trenton with $15,000 capital to deal in brass goods.

Blue Ridge Manufacturing Company, of Plainfield, N. J., has been chartered at Trenton with $125,000 to manufacture stamped metal goods.

Irvington Tube and Bending Company, of Irvington, N. J., has been chartered at Trenton with $100,000 capital to deal in metal tubing.

Radio Instrument Corporation, of Newark, N. J., has been incorporated at Trenton with $75,000 capital to make radio supplies.—C. A. L.

PHILADELPHIA

February 4, 1924.

Metal merchants in the Philadelphia district are rather displeased and dissapointed in the present market conditions. Some time ago the general belief was that by the middle of January the entire structure of the market would assume a better aspect, that numerous orders would be received; small orders buying would disappear from the market and that sizable orders would be placed. Apparently little has developed, as most of the companies were found to be pessimistic about the present. However, in some branches of the industry, especially in aluminum and copper wire cloth, the tone is better than for some time. There is a satisfactory demand for copper wire cloth, and despite this condition, prices are lower than a year ago. One of the largest plants in the country making this material is working to full capacity. The brass and copper market, generally speaking, is spotty with plenty of inquiries. Some inquiries are being received from condenser manufacturers who apparently have considerable business in sight. If the demand materializes, sales in the hundreds of thousands of pounds will be recorded. Prices of both copper and brass have strengthened.

Aluminum manufacturers supplying the automotive industry are experiencing a tremendous volume of business. Aluminum parts are being cast in greater quantities and prices are advancing slightly. One large corporation's output for February is entirely sold and orders for March have been booked for several weeks, and, according to foundries, it appears obvious that the condition will prevail for some time. How long, however, is problematical, as the demand for new automobile bodies soon will cease and the needs of other buyers are gradually being filled.

The lead foundries are virtually in the same condition as the aluminum manufacturers. Heavy demands are being made on lead plants by battery and paint manufacturers. The radio industry and its demand for storage batteries and other parts also is reflecting a better trend in the market.

The bronze trade as usual continues to occupy a leading position in the metal industry in this locality. Prices are slightly higher with no apparent diminution of inquiries and firm orders. Electro platers' business is virtually in the same position as last month. Very few, if any, new large contracts have been written, but the volume of work on hand is sufficient to keep local platers busy for many weeks. There are a number of home site developments projected in this district and the demand for plated ware is expected to soon materialize with keen competition for the business.

Scrap metal smelters' trade is steady. Offerings of old metals continue in volume with an almost similar demand for the smelted product. Prices are virtually unchanged.—A. F. C.

MIDDLE WESTERN STATES

PITTSBURGH, PA.

February 4, 1924.

Many manufacturers throughout the state are reported to be planning the expansion of their production schedules, and to broaden their sales efforts. Jobbers for the most part continue to advise caution, and to urge retailers to increase their stock turns.

The **Westinghouse Electric and Manufacturing Company** has been awarded a contract for electrical generating equipment approximating $75,000 by Dwight P. Robinson, consulting engineer for the Los Angeles Gas and Electric Company.

Zinc plates, due to the small amount of marine work current, are in little demand. What business is moving is mainly for small repairs. Zinc in sheets and strips are moderately active. The demand for strips from battery and radio manufacturers is excellent, with sheets gradually easing off with the decline in industrial building lines. Prices are stiffening in proportion with the recent advance in raw material.

Statuary maufacturers are looking forward to a good season. The quiet that has prevailed since the Christmas trade ceased is passing with the renewal of orders for the Eastern season. Demand is largely for church work, with but little interest in fancies, the latter having finished their department store season before the holidays. Smaller models are more active now with some big business offering for new churches under construction.

At a meeting of the board of directors of the Macbeth-Evans Glass Co., held January 16, Howard S. Evans was elected president, to fill the vacancy caused by the death of Thomas Evans, and George D. Macbeth was elected vice-president.—H. W. R.

DETROIT, MICH.

February 4, 1924.

The brass, copper and aluminum concerns in Detroit are experiencing an unusually strong winter run of business. Practically every plant in the city is operating. Most of them, however, are engaged on automobile work. Manufacturers of plumbers' and steamfitters' supplies are doing much more business than in former winters. Manufacturing jewelers also report a good business. This line was rather quiet for a time in December, but January shows a considerable improvement. There is practically no unemployment reported. The Employers' Association reports more plants operating to capacity than in any other mid-winter season. Most of this work is due to the strong demand for automobiles.

More scrap metal is said to be produced in Detroit than in any other city in the country. When the automobile factories are operating to full capacity as they are today, it is estimated by scrap dealers, plants here produce approximately 160,000 tons each month. A large amount of this is copper and brass, but of course much more is iron and steel. The **Ford Motor Company** is the largest scrap producer, but this great industry now salvages every bit of it which accounts in some measure for the low price of these cars. The most rigid economy and savings is practiced by the Ford management. Absolutely nothing is allowed to go to waste. Other Detroit manufacturing concerns are becoming more active in conserving their scrap with the result that costs of manufactured articles are being reduced.

C. B. Bohn, president of the **Bohn Foundry Company,** which makes a specialty of aluminum castings, declares the world is just entering an aluminum age. "The latter half of the nineteenth century was known as the 'Iron age'," Mr. Bohn says. "The first quarter of the present century is known as the 'Steel age.' This is now passing and soon we'll be in the 'Aluminum age.' Even in the earliest days progressive manufacturers resorted to aluminum for such parts as engine crank cases, transmission housing and other parts that could be made of castings, but the aluminum of those days was crude as compared with that which we now produce. Today we have aluminum that is almost as strong as steel and is susceptible of almost as many treatments and processes. Not only do I expect to see complete automobiles made of aluminum, but in support of that prediction I can state that automobiles already have been made almost entirely of aluminum, the exception being the thin cylinder linings of steel or iron, crank shafts, cam shafts and axle shafts. Cylinder castings, crank cases, transmission housing, rear axle housings, wheels, brake drums, steering wheels, frames and bodies can now be made of aluminum that is quite as dependable, and of course very much lighter than the materials at present used. The only obstacle in the way is the difference in cost. We still have another year to go before we enter the second quarter of the twentieth century, and I confidently predict that the next year will show such an advance that every one will recognize the dawn of the new era, the 'Aluminum age'."

At a recent meeting of stockholders of the **Detroit Copper & Brass Rolling Mills** the following were elected directors: A. H. Buhl, L. D. Buhl, F. J. Hecker, A. Henderson, F. H. Hoffman, L. H. Jones, R. P. Joy, A. J. Peoples, H. D. Sheldon. At a subsequent meeting the directors elected the following officers: President, L. H. Jones; vice-presidents, R. P. Joy and A. H. Buhl; secretary and treasurer, A. J. Peoples. The following officers were appointed: General manager, L. H. Jones; assistant general manager, F. H. Hoffman; assistant treasurer and assistant secretary, W. P. Bache; auditor, J. E. Workman; works manager, A. Henderson.

Fred Galster, general manager of the Acme Wire & Iron Works, has been re-elected president of the **Detroit Ornamental Iron, Bronze and Wire Club.** The directors are John Moynahan, of Moynahan & Duchene, Inc., O. C. Bergman, Barnes Wire Fence Company, and George Scherer, Advance Wire Works, who also is secretary and treasurer.

The **Michigan Copper & Brass Company,** 5851 West Jefferson avenue, is erecting a 50,000 gallon tank at an expense of $10,000.—F. J. H.

FOREIGN

BIRMINGHAM, ENGLAND

January 18, 1924.

A considerable expansion of British trade is shown by the last Board of Trade returns and in this the various metal industries have shared. The total hardware shipments as compared with 1922 increased by nearly £1,000,000. Metals and manufactures exported amounted in 1923 to £14,514,858, an increase of £2,991,383 and imports to £25,625,954, an increase of £7,464,010. Electrical goods and apparatus were exported to the total value of £10,226,524, an advance of £2,908,694. Labor statistics also indicate that the gradual recovery of trade throughout the kingdom was well maintained during 1923. At the beginning of the year 11.1 per cent of the union members were unemployed and in December the percentage was 8.7. The most marked improvement was in the metal trades. Although business has been slow in making a start after Christmas, the prospects in all the non-ferrous metal industries are considered good. The suspense which has prevailed is due, no doubt, in some measure to the political situation.

Much work is expected to come to firms in the Midland brass and other metal trades as the result of the extensive orders which have been placed by home and foreign railways for new rolling stock. Enquiries are already coming in for tubes and other locomotive requirements, car fittings and lighting equipment. Shipbuilding though it has not gone ahead so quickly as was expected since the return of the boilermakers to work, is on the increase and as the year advances may be counted upon to bring a gradual increase of metal trade business. In the meantime, the automobile trade is providing an increasing amount of work in the way of accessories and fittings and is keeping the aluminum founders

busy. Makers of light cars especially can sell as fast as they can make.

Foundry business generally is improving. Makers of moulding machines, core machines and other foundry appliances are doing much better than they did last year at home and their export trade is growing especially with South Africa. Aluminium hollow-ware manufacturers have derived some advantage in the home market from the 33⅓ per cent duty imposed under the Safeguarding of Industries Act, but the stocks rushed over from Germany in advance are not yet exhausted. Prices of home-made goods have been reduced since the Act was put into force. In default of a cheap and generally applicable method of soldering aluminium, autogenous welding is being largely adopted.

In the standard lines of brassfoundry business up to Christmas was good. Housebuilding in this country is being speeded up, with a consequent increase of orders for plumbers and other domestic brassfoundry. Cabinet brassfoundry is in better request, the furniture as well as the building trades having increased their requirements. The sheet, tube and wire mills after a short lull are again getting busy. Parts for wireless receiving sets are in growing request, to the great advantage of producers of extruded rods.

Jewellers, now that the Christmas rush is over, appear to be in for another period of depression. Silversmiths have been doing better lately, but electro-plate business is again dull. Railway companies are beginning to order table-ware for hotel and car service, but little business is coming from shipowners and export orders are scarce. In spoons and forks, at present the busiest section of the table-ware industry, nickel silver in competition with electro-plate and the new stainless metals has regained some of its lost ground.—G.

Business Items—Verified

No-Dust Drying Machine Company, Providence, R. I., has been taken over by the **Blake & Johnson Company,** of Waterbury, Conn.

John Date, 13 Concord Street, Montreal, Canada, states that, contrary to certain published statements, he is not in the market for any foundry equipment.

The **International Nickel Company** has issued its quarterly balance sheet, showing a net profit for three months, after preferred dividends and taxes, of $387,124.89.

The **Norton Company,** New Bond Street, Worcester, Mass., manufacturer of abrasive products, has commenced the erection of a one-story addition to cost about $25,000.

Erie Brass & Copper Company, Erie, Pa., was totally destroyed by fire on Monday evening, January 21, involving a loss of approximately $300,000, which is covered by insurance.

The **Lubree Die & Stamping Company** has opened a shop at 210 Canal Street, New York City, for the manufacture of blanking combination and drawing dies and stamping for the trade.

The **W. W. Sly Manufacturing Company,** Cleveland, Ohio, has appointed the **P. H. McArdle Equipment Company,** New Orleans, La., representative for Louisiana, Mississippi, Texas and Florida.

The **New Haven Copper Company,** Seymour, Conn., reports that, contrary to rumors, there has been no change in ownership as yet. This concern operates a rolling mill and tinning department.

The **Economical Machine Die & Tool Company,** 141 Madison Avenue, New York City, has opened a shop for the manufacture of dies and tools for sheet metal work. The company also does stamping for the trade.

The **Haines, Jones & Cadbury Company,** 1136 Ridge Street, Philadelphia, Pa., manufacturer of plumbing equipment and supplies is having plans drawn for a four-story warehouse on S. Main Street, Wilkes-Barre, Pa.

The **Metallurgical Service Company,** standard heating treating equipment and supplies, has been organized by N. M. Salkover at 405 Mercantile Library Building, Cincinnati, Ohio. Mr. Salkover is a graduate of the University of Cincinnati.

The **Atlas Tool Company,** 799 Greenwich Street, New York City, has installed a department for japanning, and is contemplating the installation of a plating department. The company manufactures metal specialties for the automobile trade.

The **Allied Die Casting Company,** Long Island City, N. Y., has been organized recently to manufacture die-castings and dies as well as die-casting equipment and machines. This concern operates the following departments: tool room, die-casting shop.

The **Lesch Silver Company,** silversmiths and electro-platers, has opened a shop at 46 Cooper Square, New York City. This concern operates the following departments: plating, lacquering, polishing, soldering and general repair of Sterling and Sheffield plate.

The **Detroit Testing Laboratory** has under construction a three-story laboratory building to be occupied entirely as a consulting, engineering and testing laboratory, at 554 Bagley avenue, Detroit. The new quarters will be ready for occupancy by April 1.

Johnson Gas Appliance Company, Cedar Rapids, Iowa, has opened a New York office at 277 Lafayette Street. Willis G. Haskell, Jr., will be located there for a few months. A complete line of all Johnson appliances, hot plates and laundry stoves has been stocked.

The **Wausau Abrasives Company,** 1007 S. Second avenue, Wausau, Wis., is in the market for additional equipment for its recently completed warehouse. The concern manufactures grinding wheels, sandpaper and other abrasives for the metal trades and woodworking industry.

Metal Penetrating Color Corporation, with offices at 90 W. Broadway and factory at 15 Shorham Avenue, New Haven, Conn., has taken over the Jordan process for rust proofing iron and steel parts. L. D. Jordan is president and Ralph Huntington, secretary and treasurer.

The **Niagara Falls Smelting & Refining Corporation,** Buffalo, N. Y., of which E. G. Jarvis is vice-president and general manager, has declared its quarterly dividend at the rate of 7 per cent, paid January 15, to stockholders of record at the close of business, December 31, 1923.

The **Hoover Suction Sweeper Company,** Hamilton, Ont., Canada, is arranging for the erection of two additional floors to its present Gage Avenue wing. This concern operates the following departments: aluminum foundry, tool room, grinding room, plating, polishing, lacquering.

On January 9, 10 and 11, the **Abrasive Company,** Philadelphia, Pa., held its annual sales conference at the factory. Sales representatives of the company from all sections of the country attended. The conference was wound up by a dinner to the visiting salesmen and officials at the Manufacturers' Club.

The **Park Rust Proof Company,** of Buffalo, N. Y., is operating under license from the Parker Rust Proof Company of Detroit, Mich., and using this process for rust-proofing of iron and steel. The Buffalo company proposes to rust-proof products for manufacturers in New York State and also Erie County, Pa.

The **American Crucible Products Company,** Elyria, Ohio, has under erection a 24 x 50 ft. addition and when this is completed will erect another building for a core making department. This concern operates the following departments: brass, bronze foundry, brass machine shop, grinding room, casting shop.

The **Metropolitan Lamp Company, Inc.,** has started a shop for the manufacture of metal table lamps as well as a general line of lighting fixtures at 88 Walker Street, New York City. This concern operates the following departments: casting shop, spinning, cutting-up shop, polishing, soldering, plating, lacquering.

Wyman & Company, 155 North Clark street, Chicago, Ill., have been incorporated to engage in the foundry business and to do nickel plating, electro-plating, etc., by H. L. Cavender, F. M. Wyman and Lee R. Cullough, with $40,000 capital. This concern operates the following departments: grinding room, plating, polishing, lacquering.

The **Pyrene Manufacturing Company,** 520 Belmont Avenue,

Newark, N. J., manufacturer of fire extinguishers, has filed plans for new works at 109 Meeker Avenue for the manufacture of anti-skid tire chains. This concern operates the following departments: galvanizing, plating, japanning, stamping, tinning, soldering, polishing, lacquering.

The **Bessemer Galvanizing Works, Inc.,** with offices in Birmingham, Ala., are rushing all work on their plant at Bessemer, Ala. They are now accepting contracts for March and April delivery. The Bessemer Galvanizing Works will use the "old reliable" hot dip process in coating with zinc and with their up-to-date equipment can handle the largest class of galvanized materials.

The **Middlesex Machine Company, Inc.,** Hartford, Conn., has been taken over by the **New Haven Sherardizing Company,** Hartford, which will continue to manufacture the No. 3 Connecticut Universal Grinders and all special machines and tools which were previously handled by the Middlesex Machine Company. The company operates the following departments: tool room, grinding room, sherardizing.

The **Frankelite Company,** D. Frankel, vice-president, 5016 Woodland Avenue, Cleveland, Ohio, manufacturer of electrical fixtures, is having plans prepared for the construction of a 3-story, 56 x 130 ft. factory and warehouse on East 51st Street; estimated cost, $75,000. This concern operates the following departments: brass machine shop, tool room, cutting-up shop, spinning, plating, stamping, soldering, polishing, lacquering.

The **American Sanitary Manufacturing Company,** Abingdon, Ill., has purchased the Northern Brass Manufacturing Company, Waukegan, Ill., and will move the business to Abingdon. The facilities of the Abingdon plant will be doubled and the capital investment will be increased greatly. The company manufactures all brass fixtures used in plumbing, and operates the following departments: brass foundry, tool room, brass machine shop, grinding room, plating.

Hardwick Stove Company, Cleveland, Tenn., operator of a gray iron and aluminum foundry, has started constructing a 4-story mounting room and is receiving bids on a one-story molding room. It is planned to increase capacity by 50 per cent in an expansion program costing approximately $500,000. This concern operates the following departments: brass and aluminum foundry, grinding room, plating, japanning, polishing, lacquering. The company is in the market for japanning ovens.

Whitehead Brothers Company, 17 Exchange Place, Providence, R. I., dealer in foundry sands, supplies and equipment, held its annual meeting in New York City recently and elected the following officers: V. L. Whitehead, Sr., chairman of the board of directors; Alfred J. Miller, president; Edward Whitehead, first vice-president; V. L. Whitehead, Jr., second vice-president; George B. Walker, treasurer; J. H. Whitehead, secretary. The board of directors was increased by the addition of two new men, these being V. L. Whitehead, Jr., and Charles E. Andrews.

The **Nippert Manufacturing Company,** Sturgeon Bay, Wis., has been organized by J. W. Nippert and Walter Haertel to manufacture hardware specialties and metal products. A site has not yet been decided upon but it is expected that a suitable location will be found and a building erected by next spring. At the start, attention will be concentrated on a patented window and screen fastener and other building specialties. Later, other products will be added to the line. The new concern is capitalized at $50,000. This concern operates a stamping department.

The **Martin-Parry Corporation,** York, Penna., has purchased the Oakes Company of Indianapolis, Ind. The plant employs 300 men and has under cover more than 60,000 square feet of floor space. The accessories and parts which the company manufactures includes: radiator fan, spare tire locks, spare wheel locks, stampings of all kinds, etc., and will continue to manufacture the same products as heretofore, in addition to supplying Martin-Parry with stampings and other metal parts. This concern operates the following departments: tool room, grinding room, japanning, stamping.

The **Ornamental Bronze Company,** Big Rapids, Mich., is remodelling its building on North State street, and while this remodelling is in progress, the firm is operating in connection with the **Hanchett Swage Works** of that city. The new place will be ready for occupation some time in February and will be composed of pattern, foundry, plating and polishing departments, to manufacture architectural and memorial bronze tablets as a main line. In addition, small statuettes, reliefs, paperweights and a score of other such novelties in bronze and aluminum will be made. This firm will specialize in aluminum pattern work and matchplates.

The **Universal Bronze Bearing Company,** Winsted, Conn., was totally destroyed by a fire of undetermined origin on January 12 with a loss of $25,000, most of it being new machinery and orders that were to have been shipped. Only the shell of the building remains. According to one of the owners, E. B. Gaylord, the loss is partly covered by insurance. This concern operates the following departments: bronze and aluminum foundry, brass machine shop, grinding room, cutting-up shop, spinning, plating, japanning, stamping, polishing, lacquering. **Arthur Bride,** who operated a foundry in the building, stated that his loss was about $1,000.

INCORPORATIONS

The **Fremont Brass & Bronze Company,** Fremont, Ohio, has been incorporated for $50,000 by O. C. Wahl, G. C. Hein, Frank J. Hein, Chris Wahl and Chester A. Culbert, to operate a brass foundry, etc.

BUSINESS TROUBLES

The **Yorkville Manufacturing Company, Inc.,** 35 Broadway, Brooklyn, N. Y., has been adjudicated bankrupt, and the first meeting of creditors will be held at Post Office Building, room 405, Brooklyn, N. Y., on February 15, 1924, at 10:30 a. m., when the creditors may attend, prove their claims, appoint a trustee, examine the bankrupt, and transact such other business as may come before the said meeting.

The **McNab & Harlin** plant, in Paterson, N. J., was practically shut down early in February, due to financial difficulties.

INDUSTRIAL CATALOGS

Direct Current Switchboard Instruments. Bulletin No. 400, issued by the Roller-Smith Company, 233 Broadway, New York City. This bulletin covers the company's small, direct current, switchboard instruments.

Direct Current Portable Instruments. Bulletin No. 210, issued by the Roller-Smith Company, 233 Broadway, New York City, on its direct current portable instruments.

"Fill-in" Steel Cement. A pamphlet issued by the J. W. Paxson Company, Philadelphia, Pa., covering "Fill-in" steel cement for filling in imperfect iron castings. It is intended to be used only on surface imperfections.

Grinding and Polishing Machinery. A set of circular letters giving intimate descriptions of the latest products of the St. Louis Machine Tool Company, 932 Loughborough avenue, St. Louis, Mo., along the lines of polishing machines with babbitt, ball or roller bearings.

The calendar distributed by the **American Brass Company,** mentioned in the January issue of The Metal Industry was etched and finished by the **Crowe Name Plate & Manufacturing Company,** 1749 Grace street, Chicago.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America.....	$100	$500	$535
American Hardware Corporation.....	100	70	72
Anaconda Copper	50	38	38¼
Bristol Brass	25	5	10
International Nickel, com.	25	14	14¼
International Nickel, pfd.	100	79½	81
International Silver, com.	100	80	...
International Silver, pfd.	100	103	108
National Enameling & Stamping.....	100	43	43½
National Lead Company, com.	100	145	147
National Lead Company, pfd.	100	112	114
New Jersey Zinc	100	148	152
Rome Brass & Copper	100	115	125
Scovill Manufacturing Company, new. ..	..	240	250
Yale & Towne Mfg. Company, new.. ..	..	69	70

Corrected by J. K. Rice, Jr., Co., 36 Wall Street, New York.

Review of the Wrought Metal Business

Written for The Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

Reports from the various mills fabricating brass and copper material indicate that a large volume of tonnage was booked during January. Part of this volume, at least, may be credited to the impression that was created by an advance in ingot copper which gave rise to the belief that there would be an advance in the finished product. The strength of the copper market, however, was not continued and no changes in price were made during the month. Prices are holding firm and as a satisfactory volume of business is being placed there is no indication of a desire on the part of any of the manufacturers to make concessions to secure business at the expense of profit.

The demand for copper products for the electrical industry continues to be heavy. Many of the electrical concerns started the year with a huge volume of contracts on their books, and with many other contracts being figured, it is expected that the consumption of copper in this trade alone during the year will set the record for all time. The automobile business and the building lines also continue to absorb large quantities of copper and brass. It is expected also, that, during the year a very extended advertising campaign will be carried forward, having for its object the promotion of the sale of copper and brass products. From all angles it appears that, as far as can now be observed, the feeling prevailing throughout the trade that 1924 will be a banner year, is well justified.

The various manufacturers of nickel silver report that heavy orders have been placed and this branch of the industry appears to be in a very flourishing condition. One of the largest dairies in the country has recently contracted for pure nickel storage tanks, and as a result of the success of experiments carried on, it is expected that many other dairies will also specify this material in their construction work.

Metal Market Review

Written for The Metal Industry by METAL MAN

COPPER

Activity in the copper market was on a moderate scale in January. Opening prices were at the level of 12¾ to 12⅞ cents, but easier tendencies developed about the middle of the month where quotations declined to 12⅜ to 12½ cents.

The market was stimulated to some extent by the more attractive offers and substantial sales were made. A continuation of buying for both domestic and export account caused a rally in the market for a short time. Holders succeeded in advancing prices to the electrolytic basis of 12⅞ cents, delivered, for shipment over two to three months. But after selling up to this level, the market reacted during the late trading to 12½ to 12⅝ cents.

A show of heaviness during the last half of the month and a decline in London quotations, coupled with low sterling exchange rates, caused hesitation among buyers generally. The domestic consumption of copper is large, but recent buying of raw material lags owing to the fact that consumers are somewhat uncertain of the stability of market values.

Production of copper continues considerably greater than demand. Consumers are waiting for more light on this situation. Evidently the statistical position of the market is the one under the closest scrutiny.

ZINC

A firmer tone has developed in zinc and present prices are on the basis of 6.87½ to 6.92½ cents New York and 6.52½ to 6.57½ cents for prime Western brands. Domestic demand is confined to moderate shipments, but the foreign outlet relieves a rather poor statistical situation.

Domestic production runs over requirements and is no argument for advancing prices. Europe needs plenty of American zinc and that fact helps to keep up a show of strength which it would be difficult to maintain but for the export demand. Without the present foreign buying zinc would be in poor position for stimulating interest among domestic buyers at going quotations.

TIN

Developments in tin have been favorable to a firm market. Although the American deliveries of 4,895 tons for January were 1,730 tons less than they were in the same month a year ago, the New York price of Straits tin at the beginning of February was 49⅜ cents for spot delivery, with March and April deliveries quoted at 49 cents.

Domestic deliveries in the last two months were 9,705 tons, compared with 12,326 tons in October and November. Notwithstanding the recent falling off in deliveries the bullish phase of the market has not suffered any serious obstacles thus far.

London operations have been conducted with remarkable boldness and confidence. Tin is the premier speculative metal at the English center and the market here is usually an echo of activities abroad. Present prices, however, are considered fraught with possible danger, but while consumption continues around current dimensions bearish sentiments carry little weight.

Stocks of tin in New York on January 31 amounted to 2,812 tons, against 1,652 tons on December 31, an increase of 1,160 tons. Total visible supply at end of January was 24,372 tons, as compared with 21,011 tons at end of December. A year ago the visible supply was 25,765 tons.

LEAD

The lead market continues active and strong, with further advances in both the domestic and foreign trading quarters. Prices are at new high levels on this movement, but the advancing tendency has no perceptible influence on demand.

Consumption continues large notwithstanding advancing prices. The volume of sales takes up production as shipments become available, and new requirements of users make it necessary to replenish stocks with remarkable frequency.

The American Smelting & Refining Co. advanced price of their product to 8.15 cents New York, being a raise of 15 points. The outside market, however, quotes 8.55 to 8.65 cents New York and 8.30 to 8.40 cents East St. Louis delivery.

ALUMINUM

Steady buying continues and supplies of aluminum are being well taken up by consumers. Brisk industrial conditions have opened up a wide demand both for virgin metal and remelted material. Supplies are in moderate volume and quote 28 to 28½ cents for virgin ingot of 99% grade. The 98-99% quality is held at 27½ to 28 cents. Remelted aluminum quotes 25½ to 26 cents for 98-99% metal. Virgin aluminum of 98-99% pure in 1923 averaged in the open market 25.41 cents, compared with an average price of 18.68 cents in 1922. The higher tariff in force since last year helped to contribute to the sharp increase in price to consumers.

ANTIMONY

There was a firmer tone to the antimony market owing to higher costs of importations from China and the reserve offerings coming from the Orient. There is no pressure to sell apparent by Chinese producers and first hand shipments were quoted recently at a minmum of 9 cents c. i. f. New York,

duty unpaid. Buyers, however, find considerable re-sale antimony at 8 to 8⅛ cents in bond for future shipment. Chinese 99% regular in carload lots quotes 10¼ to 10½ cents duty paid. Demand is chiefly for small quantities, but broader trade is expected in the next few weeks.

QUICKSILVER

The quicksilver market is dull and easy. Signs of weakness appeared recently and nothing has taken place in the way of demand to stimulate business. Prices are in buyers' favor and quote from $59 to $61 per flask, according to seller.

PLATINUM

Refined platinum has declined to $122, against $125 a few weeks ago. Buying is not particularly active so far reported and holders have made a slight concession in price.

SILVER

Inquiry for silver improved in January and transactions reflected a large foreign demand. Buying for India was unusually good, and China also was an important customer in this market. Production has been greatly reduced in Mexico and other sources of supply will find a freer outlet for the amounts available for shipment. Total silver exports to China and India in 1923 are estimated at over 93,000,000 ounces, against 69,600,000 ounces for all Asia in 1922 and 43,000,000 ounces in 1921. Imports of silver into the United States in 1923 were $74,453,530 and exports $72,467,844. The silver producers of the country are understood to have presented the proposal for a Silver Export Association to the Secretary of Commerce, Herbert Hoover, for his decision as to the legality of the proposed association. Silver bullion prices on February 1 were 63⅞ cents New York and 33 5/16d. London.

OLD METALS

Buyers have been restricting purchases of scrap metals to limited tonnages. The weak and unsettled conditions in new copper have operated against important activity in brass scrap and old copper. There was a broader market for old lead and this was a feature among dealers. A good demand was also noted for aluminum and zinc. Dealers' buying prices are 11 to 11¼ cents for crucible copper, 9¼ to 9½ cents for light copper, 7½ to 8 cents for brass clippings, 6½ to 6¾ cents for heavy lead, 4¼ to 4½ cents for new zinc scrap, and 19 to 20¾ cents for new aluminum clippings.

WATERBURY AVERAGE

Lake Copper—Average for 1923, 14.979—January, 1924, 13.00.

Brass Mill Zinc—Average for 1923, 7.479—January, 1924, 7.25.

Daily Metal Prices for the Month of January, 1924

Record of Daily, Highest, Lowest and Average

Metal Prices for February 11

	1	2	3	4	7	8	9	10	11	14	15	16	17
Copper (f. o. b. Ref.) c/lb. Duty Free.....													
Lake (Delivered)	*	13.125	13.125	13.125	13.125	13.00	13.00	13.00	13.00	12.75	12.75	12.75	12.75
Electrolytic	.....	12.875	12.875	12.875	12.875	12.80	12.70	12.60	12.60	12.50	12.45	12.40	12.40
Casting	.....	12.60	12.60	12.60	12.60	12.50	12.50	12.375	12.375	12.375	12.375	12.35	12.35
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.....													
Prime Western	.....	6.275	6.30	6.35	6.375	6.40	6.425	6.45	6.425	6.40	6.375	6.375	6.40
Brass Special	.....	6.35	6.40	6.45	6.45	6.50	6.50	6.525	6.50	6.475	6.45	6.45	6.50
Tin (f. o. b., N. Y.) c/lb. Duty Free.....													
Straits	.....	47.125	47.375	47.125	47.375	48.00	48.375	48.00	48.50	48.875	49.325	49.125	48.875
Pig 99%	.....	46.50	46.75	46.50	46.875	47.50	47.875	47.50	48.00	48.375	48.875	48.625	48.375
Lead (f. o. b., St. L.) c/lb. Duty 2½c/lb.....	.....	8.10	8.05	8.10	8.10	8.10	8.10	8.20	8.20	8.15	8.05	8.05	8.10
Aluminum c/lb. Duty 5c/lb.	.....	28.25	28.25	28.25	28.25	28.25	28.25	28.25	29.00	29.00	28.50	28.50	28.50
Nickel c/lb. Duty 3c/lb.....													
Ingot—Internat. Nick. Co.....	.....	29	29	29	29	29	29	29	29	29	29	29	29
Outside Spot	.....	28	28	28	28	28	28	28	28	28	28	28	28
Electrolytic (Internat. Nick. Co.).....													
Ni.—99.80 contam. impur.—.14.....	.....	32	32	32	32	32	32	32	32	32	32	32	32
Brit.-Amer. Nick. Corp.....													
Ni.—98.50 contam. impur.—.80.....	.....	28	28	28	28	28	28	28	28	28	28	28	28
Antimony (J. & Ch.) c/lb. Duty 2c/lb.....	.....	9.875	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.125	10.25
Silver c/oz. Duty Free.....	.....	64.375	64.375	64.375	64.375	64.00	64.25	63.25	62.75	63.25	63.00	62.75	63.125
Platinum $/oz. Duty Free.....	.....	125	125	125	125	122	122	122	122	122	122	122	122

	18	21	22	23	24	25	28	29	30	31	High	Low	Aver.
Copper (f. o. b. Ref.) c/lb. Duty Free.....													
Lake (Delivered)	12.75	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.25	12.75	12.966
Electrolytic	12.50	12.50	12.60	12.65	12.65	12.65	12.65	12.65	12.55	12.55	12.875	12.40	12.632
Casting	12.35	12.45	12.50	12.50	12.50	12.50	12.50	12.50	12.45	12.45	12.60	12.35	12.468
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.....													
Prime Western	6.45	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.55	6.55	6.275	6.434
Brass Special	6.50	6.55	6.55	6.55	6.60	6.55	6.55	6.55	6.60	6.65	6.65	6.35	6.509
Tin (f. o. b., N. Y.) c/lb. Duty Free.....													
Straits	49.00	49.25	50.00	51.00	50.375	50.00	48.50	48.375	48.375	49.375	51.00	47.125	48.744
Pig 99%	48.50	48.75	40.00	49.50	49.00	48.50	48.00	47.875	47.875	48.875	49.50	46.50	48.074
Lead (f. o. b., St. L.) c/lb. Duty 2½c/lb.....	8.20	8.25	8.30	8.15	8.20	8.20	8.25	8.25	8.20	8.20	8.30	8.05	8.159
Aluminum c/lb. Duty 5c/lb.	28.50	28.50	28.50	28.50	28.50	28.50	28.50	28.50	28.50	28.50	29.00	28.25	28.466
Nickel c/lb. Duty 3c/lb.....													
Ingot—Internat. Nick. Co.....	29	29	29	29	29	29	29	29	29	29	29	29	29
Outside Spot	28	28	28	28	28	28	28	28	28	28	28	28	28
Electrolytic (Internat. Nick. Co.).....													
Ni.—99.80 contam. impur.—.14.....	32	32	32	32	32	32	32	32	32	32	32	32	32
Brit.-Amer. Nick. Corp.....													
Ni.—98.50 contam. impur.—.80.....	28	28	28	28	28	28	28	28	28	28	28	28	28
Antimony (J. & Ch.) c/lb. Duty 2c/lb.....	10.25	10.50	10.50	10.50	10.50	10.30	10.50	10.40	10.30	10.25	10.50	9.875	10.193
Silver c/oz Duty Free.....	62.875	63.00	63.50	63.25	63.375	63.00	63.375	63.375	63.00	63.25	64.375	62.75	64.489
Platinum $/oz. Duty Free.....	122	122	122	122	122	122	122	122	122	122	125	122	122.27

*Holiday.

FEBRUARY 11.—**Copper:** Lake, 13.00; Electrolytic, 12.65; Casting, 12.50. **Zinc:** Prime Western, 6.70; Brass Special, 6.80. **Tin:** Straits, 51.75; Pig 99%, 51.25. **Lead,** 8.85. **Aluminum,** 28.50. **Nickel:** Ingot, International Nickel Company, 29; Outside Spot, 28; Electrolytic, International Nickel Company, 32; British-America Nickel Corporation, 28. **Antimony,** 10.50. **Silver,** 64.815. **Patinum,** $125.00.

Metal Prices, February 11, 1924

INGOT METALS AND ALLOYS

Brass Ingot, Yellow	9½to11
Brass Ingots, Red	11½to13½
Bronze Ingot	13 to14
Bismuth	$2.40
Cadmium	75
Casting Aluminum Alloys	21 to24
Cobalt—97% pure	$2.75
Manganese Bronze Castings	22 to35
Manganese Bronze Ingots	13 to16
Manganese Bronze Forging	33 to42
Manganese Copper, 30%	28 to45
Magnesium Metal	$1.25–1.50
Parsons Manganese Bronze Ingots	17½to19
Phosphor Bronze	24 to30
Phosphor Copper, guaranteed 15%	18 to21
Phosphor Copper, guaranteed 10%	17½to21
Phosphor Tin, guaranteed 5%	58 to68
Phosphor Tin, no guarantee	53 to63
Quicksilver, per flask, 75 lbs	$61—62
Silicon Copper, 10%.....according to quantity	28 to35

OLD METALS

Buying Prices		Selling Prices
11 to11¼	Heavy Cut Copper	12½to13
10½to10¾	Copper Wire	12 to12¼
9 to 9¼	Light Copper	10¼to10¾
9 to 9¼	Heavy Machine Comp	10½to11
6¼to 6½	Heavy Brass	8½to 9
5 to 5½	Light Brass	6¼to 6¾
6½to 6¾	No. 1 Yellow Brass Turnings	7¼to 8¼
8¼to 8½	No. 1 Comp Turnings	9 to 9¾
5¾to 6¼	Heavy Lead	6¼to 6½
2¾to 3½	Zinc Scrap	3¾to 4¼
8¼to 8¾	Scrap Aluminum Turnings	10¾to11¼
14¼to14¾	Scrap Aluminum, cast alloyed	16¼to16¾
15¼to16¼	Scrap Aluminum, sheet (new)	17¼to18¼
22¼	No. 1 Pewter	26¼
13¼	Old Nickel anodes	15¼
21¼to23¼	Old Nickel	25¼to27¾

BRASS MATERIAL—MILL SHIPMENTS

In effect Jan. 11, 1924

To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.17¼	$0.19	$0.20¾
Wire	0.17¾	0.19½	0.21¼
Rod	0.15	0.19¾	0.21½
Brazed tubing	0.25¼	.....	0.30½
Open seam tubing	0.25¼	.....	0.30½
Angles and channels	0.28¼	.....	0.33½

To customers who buy less than 5,000 lbs. in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.18¼	$0.20	$0.21¾
Wire	0.18¾	0.20½	0.22¼
Rod	0.16	0.20¾	0.22½
Brazed tubing	0.26¼	.....	0.31½
Open seam tubing	0.26¼	.....	0.31½
Angles and channels	0.29¼	.....	0.34½

SEAMLESS TUBING

Brass, 21½c. to 22½c. net base.
Copper, 22½c. to 23½c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod	19¼c. net base
Muntz or Yellow Metal Sheathing (14"x48")	17¼c. net base
Muntz or Yellow Rectangular Sheets other Sheathing	18¾c. net base
Muntz or Yellow Metal Rod	15¼c. net base

Above are for 100 lbs. or more in one order.

COPPER SHEET

Mill shipments (hot rolled)	20½c. to 21½c. net base
From stock	21c. to 22½c. net base

BARE COPPER WIRE—CARLOAD LOTS

15¼c. to 15⅜c. net base.

SOLDERING COPPERS

300 lbs. and over in one order	19¼c. net base
100 lbs. to 200 lbs. in one order	19¾c. net base

ZINC SHEET

Duty, sheet, 15%. Cents per lb.

Carload lots, standard sizes and gauges, at mill, 9½c. basis less 8 per cent. discount.

Casks, jobbers' prices	11c. net base
Open casks, jobbers prices	11½c. to 12c. net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga. and heavier, base price	37c.
Aluminum coils, 24 ga. and heavier, base price	35c.
Foreign	38-40c.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Nickel Silver Sheet Metal

10%	Quality	24½c.
15%	"	26c.
18%	"	26¾c.

Nickel Silver Wire and Rod

10%	"	27¾c.
15%	"	31c.
18%	"	34c.

MONEL METAL

Shot	32
Blocks	32
Hot Rolled Rods (base)	40
Cold Drawn Rods (base)	48
Hot Rolled Sheets (base)	42

BLOCK TIN SHEET AND BRITANNIA METAL

Block Tin Sheets—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c. over Pig Tin. 40 to 100 lbs., 15c. over 25 to 50 lbs., 17c. over, less than 35 lbs., 25c. over.

No. 1 Britannia—18" wide or less. No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over Pig Tin. 50 to 100 lbs., 15c. over, 25 to 50 lbs., 20c. over, less than 25 lbs., 25c. over. Above prices f. o. b. mill.

SILVER SHEET

Rolled silver anodes .999 fine are quoted at from 67c. to 69c. per Troy ounce, depending upon quantity.

Rolled sterling silver 64½c. to 66½c.

NICKEL ANODES

85 to 87% purity	37½c.–39½c. per lb.
90 to 92% purity	40c.–42c. per lb.
95 to 97% purity	42c.–44c. per lb.

Supply Prices, February 11, 1924

CHEMICALS

In Commercial Quantities—New York Prices

Acetone	lb.	.21–.23
Acid—		
Boric (Boracic) Crystals	lb.	.12
Hydrochloric (Muriatic) Tech., 20 deg., Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., Carboys	lb.	.08
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg. Carboys	lb.	.06
Nitric, 42 deg. Carboys	lb.	.07
Sulphuric, 66 deg. Carboys	lb.	.02
Alcohol—		
Butyl	lb.	.45–.50
Denatured in bbls.	gal.	.51–.55
Alum—		
Lump, Barrels	lb.	.04
Powdered, Barrels	lb.	.04½
Aluminum sulphate, commercial tech	lb.	.02½–.03
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—		
Sulphate, tech. Barrels	lb.	.03¼
Sulphocyanide	lb.	.65
Argols, white, see Cream of Tartar	lb.	.27
Arsenic, white, Kegs	lb.	.16
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Blue Vitriol, see Copper Sulphate.		
Borax Crystals (Sodium Biborate), Barrels	lb.	.06
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.07
Chrome Green, bbls.	lb.	.36
Cobalt Chloride	lb.	—
Copper—		
Acetate	lb.	.37
Carbonate, Barrels	lb.	.20
Cyanide	lb.	.46
Sulphate, Barrels	lb.	.05½
Copperas (Iron Sulphate, bbl.)	lb.	.02
Corrosive Sublimate, see Mercury Bichloride.		
Cream of Tartar, Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	6.75
Gold Chloride	oz.	14.00
Gum—		
Sandarac	lb.	.26
Shellac	lb.	.59–.61
Iron, Sulphate, see Copperas, bbl	lb.	.02
Lead Acetate (Sugar of Lead)	lb.	.13
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	1.15
Nickel—		
Carbonate Dry	lb.	.40
Chloride, 100 lb. lots	lb.	.22¼
Salts, single bbls	lb.	.10½
Salts, double, bbl	lb.	.10
Paraffin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic Electrolytic 88-92% fused, drums	lb.	.09
Potassium Bichromate, casks	lb.	.09¾
Carbonate, 80-85%, casks	lb.	.06
Cyanide, 165 lb. cases, 94-96%	lb.	.65
Pumice, ground, bbls	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls	lb.	.03
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.08
Silver Chloride, dry	oz.	.86
Cyanide	oz.	—
Nitrate, 100 ounce lots	oz.	.45¾
Soda Ash, 58%, bbls	lb.	.02½
Sodium—		
Biborate, see Borax (Powdered), bbls	lb.	.06
Cyanide, 96 to 98%, 100 lbs	lb.	.22
Hyposulphite, kegs	lb.	.04
Nitrate, tech. bbls	lb.	.03
Phosphate, tech., bbls	lb.	.03¾
Silicate (Water Glass) bbls	lb	.02
Sulpho Cyanide	lb.	.45
Soot, Calcined	lb.	—
Sugar of Lead, see Lead Acetate	lb.	.13
Sulphur (Brimstone) bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.30
Tripoli, Powdered	lb.	.03
Verdigris, see Copper Acetate	lb.	.37
Water Glass, see Sodium Silicate, bbls	lb.	.02½
Wax—		
Bees, white ref. bleached	lb.	.55
Yellow, No. 1	lb.	.35
Whiting, Bolted	lb.	.02½–.06
Zinc, Carbonate, bbls	lb.	.13–.17
Chloride, 600 lb. lots	lb.	.07
Cyanide	lb	.37
Sulphate, bbls.	lb.	.03¼

COTTON BUFFS

Open buffs, per 100 sections (nominal).

12 inch, 20 ply, 64/68, cloth	base,	45.10
14 inch, 20 ply, 64/68, cloth	base,	56.05
12 inch, 20 ply, 84/92, cloth	base,	48.65
14 inch, 20 ply, 84/92, cloth	base,	65.50
12 inch, 20 ply, 88/96 cloth	base,	53.50
14 inch, 20 ply, 88/96, cloth	base,	72.10
Sewed Buffs, per lb., bleached and unbleached	base,	.65 to .75

FELT WHEELS

		Price Per Lb. Less Than 100 Lbs.	300 Lbs. and Over
Diameter—10" to 16"	1" to 3"	2.75	2.50
" 6" 8" and over 16"	1" to 3"	2.85	2.60
" 6" to 24"	Over 3"	3.15	2.80
" 6" to 24"	½" to 1"	3.75	3.50
" 4" to 6"	¼" to 3"	4.75	Any quantity
" Under 4"	¼" to 3"	5.35	

Grey Mexican or French Grey—10c. less per lb. than Spanish, above. Odd sizes, 50c. advance.